Vol. 5 No. 4. June, 1946

ANNALS OF THE RHEUMATIC DISEASES

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LONDON
BRITISH MEDICAL ASSOCIATION
TAVISTOCK SQUARE, W.C.1

YEARLY SUBSCRIPTION (4 NUMBERS) 25/- U.S.A. $6.00 SINGLE NUMBER 7/6

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EDITORIAL

This issue of the *Annals* is devoted for the most part to the history of the rheumatic diseases in the war of 1939–45, and the Editors are fortunate in being able to include a full account of the management of chronic arthritis among soldiers of the United States Army, by Colonel Philip Hench and Major Edward Boland. They are indebted for permission to publish this to the Surgeon-General of the U.S. Army and to the *Annals of Internal Medicine*. Although it is the policy of the *Annals* not to publish matter which has appeared elsewhere, a departure from this rule appears to be amply justified by the importance of the subject and the valuable observations contained in this report.

Three papers on the incidence and management of rheumatic diseases in the armies of Great Britain and the Empire and its allies are also published. These have been prepared for the Medical History of the War as a basis for the section on the subject which will be included and will appear at a later date. Special permission for these preliminary reports to appear in the *Annals* has been given by Sir Arthur MacNalty, the Editor-in-Chief, and Major-General Sir Alexander Biggam, Editor of the section on Rheumatism in the Army.

The study of the incidence and treatment of rheumatic diseases in the war just ended shows a great advance in the interest taken in this important subject and in the organization of treatment. The troops were thus greatly benefited, and much has been added to our knowledge of different aspects of the subject. The influence of arduous service conditions, of climatic and racial factors, of prophylactic and hygienic measures, and many other features have received special attention, both at home and abroad, under conditions differing vastly from theatre to theatre; and this varied experience will be found of high value. More information, especially statistical, is not yet available, but will appear in the History of the War when that comes to be published. The practice of the U.S.A. Army embodies many novel features, but the relative incidence of rheumatic disease is much the same as in the British and Dominion Forces.

It is hoped to add two additional numbers to the present volume—making six instead of four—in order that each volume may coincide with one calendar year. Volume 6 will thus begin to appear early in 1947. The issue of December, 1946, will contain the index to volumes, and also, possibly, of the five volumes which have appeared up to the end of this year, and the four volumes of the predecessor of the Annals—the *Reports on Chronic Rheumatic Diseases of the Special Committee of the Royal College of Physicians.*

During the war years the extreme shortage of paper in Great Britain has made it impossible to publish more than the minimum number of copies required for any one issue of the *Annals*. As a result, we are now unable to meet numerous requests for back numbers; these requests are coming in from the United States, from South America, and from libraries in Europe. If, therefore, any readers have unwanted single copies or sets of the *Annals of the Rheumatic Diseases* for the war years, we should be grateful to receive them. Parcels should be addressed to the Publishing Manager, British Medical Association, B.M.A. House, Tavistock Square, London, W.C.1.

THE MANAGEMENT OF CHRONIC ARTHRITIS AND OTHER RHEUMATIC DISEASES AMONG SOLDIERS OF THE UNITED STATES ARMY*

BY

PHILIP S. HENCH, M. C. (Colonel, Army of the U.S.) †
and
EDWARD W. BOLAND, M. C. (Major, Army of the U.S.) ‡

During the First World War about 93,000 American soldiers developed some sort of "rheumatism." [1] Four common rheumatic diseases—rheumatoid arthritis, rheumatic fever, osteo-arthritis, and muscular rheumatism—accounted for about 80% of these cases (Table 1). The subsequent cost to the government of these 92,633 cases of rheumatism has never been estimated; it must have been very great. In 1931, thirteen years after the war, the Veterans' Administration was paying over $10,000,000 a year in disability compensations to about 35,000 ex-Servicemen with "arthritis," [2] and in 1943—twenty-five years after the war—the Veterans' Administration was expending annually $2,500,000 in pensions alone to soldiers of World War I with rheumatic heart disease.[3]

TABLE 1.—INCIDENCE OF CERTAIN DISEASES IN THE UNITED STATES ARMY, FIRST WORLD WAR (April 1, 1917, to Dec. 31, 1919)

Total of Mean Annual Strengths for the War Period—4,128,479 Soldiers

Condition	Total Cases	Percentage	Rates per 1,000 soldiers
Arthritis (rheumatoid and osteo-arthritis).	33,613	36	8·14
Acute articular rheumatism ‖ (rheumatic fever).	24,770	27	6·00
"Muscular rheumatism" §	12,093	13	2·93
Gonorrhoeal arthritis ..	7,895	9	1·91
"Myositis" §	4,135	4	1·00
"Synovitis" §	3,665	4	·87
"Tenosynovitis" § ..	2,671	3	·65
"Ankylosis of joints" § ..	1,907	2	·46
"Other diseases of joints" § (non-traumatic).	1,614	2	·39
Tuberculous arthritis ..	188	—	·05
Gouty arthritis	82	—	·02
Total ..	92,633	100	22·43

Need for Rheumatism Centres

During the First World War no special rheumatism centre was officially established by the War Department. However, Major Ralph Pemberton and his associates were afforded the opportunity of studying carefully at United States General Hospital Number 9, Lakewood, New Jersey, 400 cases of chronic arthritis among soldiers.[4] "Although General Hospital Number 9 was never designated as a 'centre,' it functioned as one." [5]

During World War I the mean strength of the American Army over a period of two and three-quarter years (33 months: April 1, 1917, to December 31, 1919) was 4,128,479. Thus, during every month of that war an average of 2,807 soldiers developed rheumatism. If the incidence rate for "rheumatic diseases" among soldiers during that war (22·4 cases per 1,000 soldiers) were maintained during this second world conflict, the War Department could expect that, out of an army of 8,000,000 soldiers, there would develop within the first two and three-quarter years of this war (namely, between December, 1941, and August, 1944, inclusive) about 180,000 cases of rheumatism—an average of about 5,454 cases during every month of the war. Of these 180,000 cases, about 64,000 cases would be of chronic rheumatoid arthritis or of osteo-arthritis. (The figures for this war are not yet available.) To prepare for such a possibility, the Surgeon-General and his Associates, with the co-operation of the American Rheumatism Association, took, in the fall of 1942, the first tentative steps toward the subsequent establishment of one or more rheumatism centres for the Army if or when the need materialized.[6] To date the need has been such that five rheumatism centres have been established—two for patients with chronic rheumatic diseases, and three for patients with rheumatic fever.¶

* From the Rheumatism Centre, Army and Navy General Hospital, Hot Springs, Arkansas.

† Director of the Rheumatism Centre and Chief of the Medical Service (now returned to the Mayo Clinic, Rochester, Minnesota).

‡ Chief of the Section on Rheumatic Diseases (now returned to Los Angeles, California).

‖ In addition to the 24,770 cases of acute articular rheumatism (rheumatic fever), there were 17,372 cases of "valvular heart disease," the great majority of which were probably rheumatic in origin.

§ These conditions were not fully defined in the original reference; the terms are those used in the Manual of the International List of Causes of Death, Second Revision, Paris, 1909; Washington, D.C., Government Printing Office, 1913.

¶ Three rheumatism centres were recently established for the joint Services (Navy, Army, Air Force) of the Canadian Government: one at St. Thomas, Ontario, opened in June, 1945; others at Winnipeg and at Nanaimo, B.C., opened in April, 1945.

The Rheumatism Centre of the United States Army at the Army and Navy General Hospital; the main building (left) is now connected with the Eastman Annex (right).

Purposes of a Centre

The majority of soldiers who develop rheumatism need not be transferred to special centres. Patients with transient muscular rheumatism, mild rheumatic fever without carditis, or acute traumatic or specific infectious arthritis can be handled effectively in the adjacent station or regional hospital. Rheumatism centres are designed for the care of difficult or progressive cases, or for diagnostic problems.[7]

The chief aims of a rheumatism centre are these:

1. *Accurate diagnosis.*—To provide a diagnostic centre where difficult cases can be studied by special methods and by medical officers with a special knowledge of rheumatic diseases.

2. *Intensive treatment.*—To provide special facilities for the treatment of the more severe or progressive cases.

3. *Prompt disposition.*—To accomplish as great a reduction in hospitalization-time as is consistent with adequate treatment.

4. *Increased salvage.*—To restore to duty, if possible, more men with "cured" or "arrested" disease.

5. *Rehabilitation.*—To educate and rehabilitate for civilian life those whose disability necessitates discharge from the Army.

6. *Application of newer advances in treatment.*

7. *Appropriate clinical studies of patients while under treatment.*

8. *Long-range economy.*—An incidental, but important aim is to reduce the costly need for disability pensions and prolonged hospitalization in Veterans' Facilities.

Centre at the Army and Navy General Hospital

On Dec. 17, 1943, the Surgeon-General designated the Army and Navy General Hospital as the first centre for the diagnosis and treatment of rheumatic diseases.[8] This hospital, the Army's oldest general hospital, was chosen because of its past history and excellent facilities. Because of the adjacent hot springs, this hospital has, since 1887, been a mecca for the rheumatic personnel of the Army. In 1933 the old main hospital building was demolished and replaced by a large new building, and in 1943 an adjacent large hotel was acquired, renovated, and connected to the main building, thus creating a capacity of 1,342 hospital beds with an additional 383 beds for patients being reconditioned (total 1,725 beds).

A proper knowledge of rheumatic diseases demands familiarity with all phases of general medicine. The productive record of American and European hospitals which have been devoted exclusively to the study of rheumatic diseases has often been disappointing. Rheumatism clinics and services in civilian hospitals maintain their vitality by, and derive much of their inspiration from, their close association with the other clinical and laboratory departments. Therefore, one of the chief advantages of this rheumatism centre is its placement in a large general hospital with its varied medical and surgical specialties. Thus the rheumatic patient commands the services of specialists in many fields.

The rapid growth of the centre is shown by the daily census of the section on rheumatic diseases, which increased from 56 patients present on a given day in January, 1944, to 704 patients actually present on a given day in October, 1944. During the year

1944, 3,105 " rheumatic patients " were admitted, and, between January and June, 1945, inclusive, 2,210 additional " rheumatic patients " were admitted—a total of 5,315 in 18 months. Many of the patients have been received from various camps throughout the country, but during recent months most of the patients have come from overseas hospitals. The majority have come by boat from the South Pacific or from the European theatre of operations, but many have come via the ambulance planes of the Air Transport Command. The speed of evacuation of certain rheumatic patients from overseas has often been startling; some have arrived here by plane 4 to 6 days after leaving South Pacific hospitals (e.g. 4 days from Saipan to Hot Springs); others have arrived within 3 to 7 days from England, Italy, or France (e.g. from Paris to Hot Springs in 3 days). Such promptness in evacuating rheumatic soldiers from overseas to hospitals equipped especially for their needs fosters a fine morale among the soldiers and their anxious relatives. A proportionate promptness in the subsequent diagnosis and disposition (consistent with adequate treatment) has done much to maintain their morale.

The Centre at Ashburn General Hospital

Because the flow of rheumatic patients to the first centre became excessive, a second centre for chronic rheumatic diseases was established on Aug. 25, 1944, at Ashburn General Hospital, McKinney, Texas.[9] During its first eight months the Section on Rheumatic Diseases at that hospital admitted about 2,200 patients.[10]

Centres for Patients with Rheumatic Fever

Also on Aug. 25, 1944, the Surgeon-General established three centres for the care of soldiers with rheumatic fever:[9] at Birmingham General Hospital, Van Nuys, California; at Foster General Hospital, Jackson, Mississippi; at Torney General Hospital, Palm Springs, California. Within the first eight months a total of about 900 patients with rheumatic fever were admitted to these three hospitals,[11] most of the patients having been transported thereto by air as soon as possible after the acute phase of the disease began to subside. These 900 patients with rheumatic fever comprised only a minority of the cases of rheumatic fever in the army; during 1942, 1943, and 1944 there were respectively about 1,300, 7,000, and 6,000 cases of rheumatic fever which developed among soldiers in the United States and were recorded by the Surgeon-General's office.[12]

The policies of the War Department regarding the diagnosis and management of rheumatic fever have been outlined.[13] The oral administration of salicylates was considered generally preferable to the intravenous administration. Sulphonamide chemoprophylaxis for the prevention of recurrences was approved; the drug of choice being sulphadiazine, 0·5 to 1·0 g. daily during the period of convalescence and reconditioning, but not of course during the acute phase of the disease.

The policies of the War Department regarding disposition of such cases are flexible, not static. In general, the following patients have been discharged rather promptly from service: those with prolonged active rheumatic fever, those with frequent recurrences, and those with significant cardiac involvement. But some patients in the last category who possessed unusual technical skills or other military qualifications have been retained on limited service if their cardiac lesions were well compensated. Most of the 900 patients admitted to these three centres have been or will be returned to temporary limited duty for six months in a warm dry climate. Thereafter, re-examination and final disposition will be made. To prevent psychic invalidism, the War Department has advised that such temporary duty should not involve undue limitation of physical activity.

These three rheumatic fever centres belong to the Army Service Forces. In addition, the Army Air Forces have initiated a programme of rheumatic fever control in several of their southern regional hospitals.[14] [15]

Relative Incidence of Rheumatic Diseases

Because the patients sent to the rheumatism centre at the Army and Navy General Hospital are selected, our census does not reflect the relative incidence of the rheumatic diseases in the Army as a whole. An analysis of our first 1,000 cases has revealed a relative incidence as given in Table 2. A more detailed survey is being prepared for a later report.

Table 2.—Incidence of Various Types of Rheumatic Diseases among the First 1,000 Consecutive Admissions to the Rheumatism Centre, Army and Navy General Hospital

	Cases	Percentage
Rheumatoid arthritis (including rheumatoid spondylitis).	331	33·1
" Psychogenic rheumatism "	200	20·0
Osteo-arthritis (primary and post-traumatic)	136	13·6
Fibrositis (intramuscular and/or periarticular; bursitis, supraspinatus, tendinitis, etc.) ..	134	13·4
Rheumatic fever	22	2·2
Gonorrhoeal arthritis	13	1·3
Gout	10	1·0
Miscellaneous conditions (listed in the order of relative frequency): sciatica, backache due to ruptured intervertebral discs and other causes, internal derangements of knees, non-specific monarthritis, traumatic arthritis and synovitis, tuberculous arthritis, psoriatic arthritis, palindromic rheumatism, joint tumors, and rare forms of joint disease.	113	11·3
Unclassified diseases of joints and related structures.	41	4·1
Total ..	1,000	100

These figures may be compared to the incidence of rheumatic diseases as seen in a general hospital which is not a rheumatism centre.[16] [17] Here, as in all rheumatism clinics, rheumatoid arthritis presented the main problem; it affected one-third of all patients admitted. About one-fifth of the patients admitted as " rheumatic " had no significant organic skeletal disease. They suffered from

psychoneurosis manifested by musculo-skeletal symptoms, a condition called by some "psychogenic rheumatism."[17] by others "psychoneurotic rheumatism"[18] or "psychosomatic rheumatism."[19] This condition will be discussed later herein. Because of the relative youth of soldiers the incidence of gout and gouty arthritis has been low, the relative incidence being 1% as compared to a relative incidence of 4 or 5% frequently seen in civilian rheumatism clinics. Thanks to modern chemotherapy, the total and relative incidence of gonorrhoeal arthritis has been low.

About one-third of our cases of rheumatoid arthritis have been of rheumatoid spondylitis—a relative incidence surprisingly high and in notable contrast to experiences in civilian practice. For many months we have had at any given time from 70 to 100 cases of rheumatoid spondylitis at this centre. The relative frequency of such cases among soldiers probably arises from three factors: (1) rheumatoid spondylitis affects males much oftener than females, and especially affects young males of military age (18 to 30 years); (2) the early symptoms of the disease—such as vague intermittent low back pain—are difficult to evaluate, and an early diagnosis is often not made—many such early cases in young men have not been recognized until after their induction into the Army; (3) the strenuous physical exertions of Army life and training soon aggravate the symptoms and bring to light these early, previously undiagnosed, cases.

The figures on the relative incidence of rheumatic diseases as seen at our centre are, with a few exceptions, in close agreement with those from the centre at Ashburn General Hospital. Through the courtesy of the Commanding Officer and Staff of that hospital we are permitted to report the relative incidence of "rheumatic diseases" among their first 800 completed cases[10] (Table 3). Thus, at the two centres the relative incidences were: rheumatoid arthritis 33 and 38%, "psychogenic rheumatism" 20 and 16%, specific infectious arthritis (including gonorrhoeal and tuberculous arthritis) 1·9 and 1·6%, and gouty arthritis 1·0 and 0·6%.

TABLE 3.—INCIDENCE OF "RHEUMATIC DISEASES" AT THE RHEUMATISM CENTRE, ASHBURN GENERAL HOSPITAL: First 800 Completed Cases

Rheumatoid arthritis	38·3%
Osteo-arthritis	26·7%
"Psychogenic rheumatism" ..	16·1%
Postural backache	2·6%
Internal derangement	1·8%
Extra-articular disease (e.g. bursitis) exclusive of fibrositis	1·6%
Specific infectious arthritis exclusive of tuberculous arthritis	1·4%
Protruded intervertebral disc ..	1·3%
Tumors	0·7%
Fibrositis	0·6%
Gouty arthritis	0·6%
Tuberculous arthritis	0·2%
Miscellaneous	8·1%
Total ..	100 %

Problem of Differential Diagnosis

So relatively inadequate was the general knowledge of the arthritides 25 years ago that a diagnosis of "acute arthritis" or of "chronic arthritis," made without further qualification, was then excusable. Thus, the articular and muscular conditions encountered in the First World War were often not clearly defined (Table 1). To-day an unqualified diagnosis of "acute arthritis" or of "chronic arthritis" is considered inadequate except in rare instances. Although there are many types of acute and chronic arthritis, the rheumatologist and the interested internist should be able usually to sub-divide them and state *what kind* of "chronic arthritis" is present. This is a matter of considerable importance in treatment, but it is especially important for a proper estimate regarding prognosis and military disposition.

An analysis of the transfer diagnoses—those with which the patients arrived at the centre—has revealed scores of patients sent here for "arthritis" who had no arthritis at all. Many patients presumed to have "osteo-arthritis" actually had rheumatoid arthritis, and vice versa. Few of the cases of gout had been correctly diagnosed. A great many of the patients with "muscular rheumatism" actually had, not myositis or fibrositis, but "psychogenic rheumatism"—psychoneurosis manifested by musculo-skeletal complaints. Such errors in diagnosis are no particular reflection on medical officers. They merely reflect the diagnostic level of the medical profession as a whole in matters rheumatologic, and exhibit once more the need of physicians in general for a wider and more critical knowledge of fundamentals in the diagnosis of diseases of joints.

Gonorrhoeal Arthritis and Arthritis Aggravated by Gonorrhoea

It is not sufficiently understood that rheumatoid arthritis can be precipitated by a gonorrhoeal infection, just as it can be precipitated by tonsillitis, influenza, or some other acute infection. Also a mild, intermittent, or quiescent rheumatoid arthritis can be aggravated by acute genital gonorrhoea. Such cases have sometimes been called "post-gonorrhoeal rheumatoid arthritis," but this condition does *not* represent chronic rheumatoid arthritis engrafted on, or evolving from, a subsiding acute gonorrhoeal arthritis; it represents simply rheumatoid arthritis precipitated or aggravated by acute genital (not articular) gonorrhoea. This entity is not new to the experienced rheumatologist. It is regularly encountered in civilian practice, and in 1% of Pemberton's cases of chronic arthritis among soldiers in the last World War the arthritis began in close relation with the onset of gonorrhoea.[4] Proven gonorrhoeal arthritis among American soldiers in this war appears to be rather rare. In

this rheumatism centre we have seen many more cases of rheumatoid arthritis precipitated or aggravated by gonorrhoea than of gonorrhoeal arthritis. Most of the former cases have been erroneously labelled gonorrhoeal arthritis, treated as such unsuccessfully by sulphonamides or penicillin or by fever therapy, and transferred to our centre labelled " gonorrhoeal arthritis resistant to penicillin and/or sulphonamides." In our experience, most cases of so-called " gonorrhoeal arthritis resistant to chemotherapy " have turned out—as shown by their subsequent course, therapeutic tests and, in some cases, articular biopsies—to be cases of rheumatoid arthritis.[20] This matter will be the subject of a later report.

" Psychogenic Rheumatism "

Physicians in general are familiar with psychoneurosis as it may affect the gastro-intestinal tract (functional dyspepsia, neurasthenia gastrica, irritable colon, anorexia nervosa, etc.) or the cardiovascular system (cardiac neurosis, soldier's heart, neurocirculatory asthenia). Physicians are not so familiar with psychoneurosis as it affects the locomotor system. " Psychogenic rheumatism "—the musculo-skeletal expression of functional disorders, tension states, or psychoneurosis—is one of the commonest causes of generalized or localized aches and pains in muscles and/or joints in either civilian or military life. It may exist alone, or may occur as a functional overlay of some rheumatic disease such as fibrositis or rheumatoid arthritis. The designation " psychoneurosis manifested by musculoskeletal complaints " is more proper than the terms " psychogenic rheumatism " or " psychosomatic rheumatism." But the term " psychogenic rheumatism " persists in token of its compactness and handiness; if its limitations are understood it can be a useful label.

Many inadequate, unadaptive soldiers unconsciously make " flight into illness " via musculoskeletal complaints which they, and some physicians also, erroneously call " rheumatism " or " arthritis." These patients have many symptoms but no objective, constitutional, röntgenographic or biochemical manifestations of disease. Actually these patients have no real " rheumatism," no true synovitis, arthritis, or organic muscular lesion; or, if some minor musculo-skeletal disease does coexist, it is insufficient to account for the severity of the disability. The clinical pattern is not that of organic rheumatic disease. Typical functional complaints referable to other systems often may be elicited. The degree of psychoneurosis present may vary from a mild anxiety tension state to a major conversion hysteria; camptocormia (hysterical bent back), bizarre gaits, peculiar articular postures, or hysterical flexed fingers are not uncommon. It will be noted that about 20% of our patients and about 16% of those admitted to the centre at Ashburn General Hospital had no significant organic rheumatic disease, at least by the time they reached the centres (Tables 2 and 3). They either had " psychogenic rheumatism " alone, having had no organic " rheumatic disease " at all, or they had a dominating " psychogenic rheumatism " which completely overshadowed an initial and still underlying mild fibrositis or arthritis, or which had completely replaced a previous rheumatic disease (e.g. fibrositis or rheumatic fever), no longer active.

The prompt recognition of " psychogenic rheumatism " is of great importance in the Army to prevent the continuation of the disorder to the point of irreversibility, to prevent unnecessary and unjustified discharge of men on life-time pensions for non-existent " arthritis " or " fibrositis," and, above all, in order to institute the proper methods for the physical and psychic rehabilitation of these unfortunate and generally misunderstood patients.

Differentiation of " Psychogenic Rheumatism " from Fibrositis

Primary fibrositis is the chief rheumatic disease from which " psychogenic rheumatism " must be differentiated. In general, primary fibrositis puts its victims at the mercy of changes in *external* environment: thus weather, heat, cold, humidity, rest, exercise, etc., characteristically influence most of them for better or for worse. On the other hand, " psychogenic rheumatism " generally puts its victims at the mercy of changes in *internal* environment: thus their symptoms may vary with mood or psyche, pleasure, excitement, mental distraction, worry, or fatigue. Space does not permit the inclusion here of more than a tabular differentiation in general terms (Table 4). The differentiation depends, of course, not on any one feature, but on a combination of features. When a case of one or the other disorder is relatively " pure," differentiation is readily made. Differentiation and a correct assay of the problem are especially difficult when a mild fibrositis coexists with a marked functional overlay. Nevertheless, this differentiation has been very useful to us.

Treatment

The comprehensive schemes of treatment used at this centre for the various rheumatic diseases are those approved by the American Rheumatism Association [21] and used by the leading rheumatologists of the country. This centre does have unusual facilities for physical therapy and hydrotherapy; these facilities are used properly, but without undue emphasis, and certainly not to the exclusion of any other useful measure.

Group lectures.—Rheumatic victims are, in general, docile, patient, and well-behaved. Of their physicians they ask surprisingly little; in lieu of the elusive " rapid-cure," they ask only for a diagnosis and a decent understanding of what they are up against, what they can do to help themselves, and what they should not do lest they make themselves worse. They will abandon the physician who brushes them off with an incomplete diagnosis or a fancy diagnosis in medical terms and " a few well chosen words." To answer their need, we have instituted here a regular rotating series of

TABLE 4.—TABULAR DIFFERENTIATION BETWEEN FIBROSITIS AND "PSYCHOGENIC RHEUMATISM"

	Fibrositis, primary type	"Psychogenic rheumatism"
General attitude	Co-operative, earnest, "objective."	Tense, anxious, "subjective," defensive, antagonistic.
Chief complaint	"Joints hurt and feel stiff."	"Can't quite describe it, doctor. It's like. . . ."
Chief symptoms	Aching, soreness, stiffness, fatigue.	Burning, tightness, weakness, numbness, tingling, queer or tired sensations.
Time of day when symptoms are worse	Morning and/or late afternoon.	Inconstant—often continuous day and night.
Aggravation or amelioration dependent on:	External or physical environment.	Internal or mental environment.
Effect of mental preoccupation (theatre, movie, bridge, etc.):	No definite relief, symptoms intrude.	Often marked relief, but perhaps "pays for it afterwards."
Symptoms analysis—		
Pain:		
Amount	+ to ++	+ to +++
Constancy	Varies in intensity during day: worse in morning, better at noon, often worse again later in day.	Tendency to be constant, "bad all the time."
Duration	Hours or days; remissions, exacerbations.	Momentary or constant, "no different," getting worse.
Location	Anatomical.	Often not anatomical.
Migration	May not migrate; if so migrates in anatomical fashion.	Bizarre, haemalgia, etc.; may follow no anatomic pattern.
Stiffness	Worse after much rest (jelling). More marked in early morning. Better after mild exercise.	Minimal or not present. Jelling not characteristic.
Fatigue	A.M. on waking: 0 to +.	Early a.m. + to +++.
	P.M. ++.	May be constant.
	"Disability causes fatigue."	"Fatigue causes disability."
Effect of rest	After prolonged rest worse (jelling).	Improvement or no effect.
Effect of exercise	Better "limbers up."	Worse during and after.
Effect of applied heat	Temporary relief—hours.	Variable—often worse.
Effect of weather	Worse when cold and damp. "Weather prophet."	Variable.
Effect of therapy:		
In general	Temporary relief.	"Nothing helps me, doctor."
Patient's attitude	Admits relief.	Defies finding a cure.
Aspirin	Temporary relief—hours.	Usually no relief (aspirin futility), or "never tried it" (aspirin inutility).
Physical therapy	Temporary relief.	Variable—often worse.
Response to examination	Co-operative as a rule: tenderness consistent.	Fearful, resistant: "touch me not" reaction.
"Extras" (associated functional complaints).	0 to +.	+ to ++++. Bizarre limps and postures, headaches, globus hystericus, sighing respirations, precordial pains, insomnia, nervousness, tremor, etc.

group consultations or "lectures on rheumatism" given in laymen's language. Of the twelve different lectures, two or three are on general topics for all patients; others are given to the appropriate groups of (generally 25 to 100) patients with a particular disease. One group of patients is usually not admitted to the specific lectures designed for another group. Patients with "psychogenic rheumatism" especially are not permitted to attend the lectures for patients with rheumatoid arthritis or fibrositis, lest misinterpretations arise. Instead, those with "psychogenic rheumatism" hear special talks designed for their particular needs and given jointly by a rheumatologist and psychiatrist.

The lectures are on the following subjects: (1) the meaning of rheumatism and arthritis; (2) facts, fads, and false concepts about rheumatism; (3) fibrositis—its meaning and management; (4) rheumatoid arthritis and its management; (5) rheumatoid spondylitis and its management; (6) facts about osteo-arthritis; (7) gout and gouty arthritis; (8) shoulder disabilities and their management; (9) body mechanics in relation to disability of joints; (10) home physical therapy (motion picture and

demonstration); (11) emotional tension and its relation to " rheumatism "; (12) the management of rheumatic fever.

These group consultations are not a substitute for, but supplemental to, individualized consultations. These are designed to project beyond the period of Army hospitalization and into the patient's home at least some of the benefits he may derive from the more formal treatments here. They also serve as an introduction to the advice which each patient will later receive from his home physician. The lectures have been well received, and, incidentally, have been a great time-saver for the busy medical officer. After each lecture the patients are encouraged to ask questions on points that bother them, no matter how trivial they may seem; any question about something not understood is a valid question. The lectures also improve morale: seeing that he is not alone in his problem and that others are worse than he, the patient takes courage.

Rheumatoid arthritis.—Our treatment for this disease is quite standard, and includes the removal of obviously infected foci, the use of highly nutritious diets (but there is no " anti-rheumatism vitamin " or specific diet), foreign protein therapy in selected cases, simple analgesics, physical therapy, occupational therapy, orthopaedic measures to prevent or correct deformities, gold salts carefully administered to selected patients whose rheumatoid arthritis is progressive in spite of more conservative measures, and röntgen therapy for certain cases of rheumatoid spondylitis. We found penicillin to be ineffective.[22]

Psychogenic rheumatism.—The treatment of psychogenic rheumatism has been an interesting but difficult problem, second here in importance only to that of the treatment of rheumatoid arthritis. Our pleasure at being able to reassure soldiers with psychogenic rheumatism that they do not have arthritis or muscular rheumatism and that they need not fear the presence of a crippling disease is tempered by the difficulty of helping them to develop insight and to accept their diagnosis, at least to the point of submitting whole-heartedly to a trial of psychotherapeutic reconditioning. In these cases the latter is of much greater value than physical reconditioning; physical reconditioning used alone in these cases accomplishes little or nothing. Patients with psychogenic rheumatism are not generally given formal courses of physical therapy or other treatments used for " organic rheumatism " except as diagnostic or therapeutic tests, because such treatments often tend to fix more firmly in their consciousness the belief that they have organic disease.

The Rheumatic Soldier's Future

Nothing could destroy a soldier's potentialities for salvage (his morale, his will to recover and to serve) more readily than the atmosphere of a " chronic hospital," a " rheumatic old soldier's home." The rheumatic soldier should not be kept in a state of prolonged uncertainty as to whether he will probably be returned to duty (limited duty, if necessary) or whether he will be discharged from the Army. Whatever his future is to be, it should be, relatively speaking, an immediate future, not a vague distant future. No hasty dispositions should be made, but in most cases it does not take long to determine the probable disposition required for a given rheumatic disease or the future military potentialities of a given rheumatic soldier. Furthermore, " right or wrong," a disposition should be made fairly promptly, unless prolonged definitive treatment is indicated; otherwise the rheumatic soldier may develop the hospital habit, the outlook of the dependent chronic invalid or pensioner. If hospitalized too long, a salvageable patient with a mild form of rheumatism may, even though he was originally well orientated, develop some form of hospital-engendered psychoneurosis or fixation of illness, and the functional overlay may become more difficult to treat than the original organic disease upon which it became superimposed. To combat these possibilities, each patient on arrival is told that his stay is decidedly not indefinite, and that his period of hospitalization will follow a rather definite and progressive, though elastic, schedule: a few days for a thorough initial physical survey, then a period of intensive treatment (generally about 3 to 8 weeks, longer in selected cases), after which it will be decided whether he can be " reconditioned " for further military service or should be " rehabilitated " for civilian life.

Reconditioning.—Getting a convalescent soldier physically and mentally prepared to return to military duty is spoken of as " reconditioning."[23] The salvageable rheumatic soldier is " reconditioned," first in the hospital by the medical programme noted above, then by a supplemental period of two or more weeks during which time he lives in a convalescent barracks and undergoes daily a programme of physical activity carefully measured to his abilities. Some patients recovering from a transient rheumatic disease can participate in a fairly strenuous programme; for other patients, who at best can only be expected to return to limited service, the reconditioning programme is less strenuous; in every instance an attempt is made to apply the programme as an individual prescription.

Rehabilitation.—If a soldier's rheumatism precludes the possibility of his return to duty within a reasonable period of time, if his disease is essentially progressive and disabling, the soldier will be made ready for discharge to civilian life and for subsequent follow-up treatments by his civilian physician or, if necessary, by a Veterans' Hospital. To such a soldier, as to the one who can return to duty, the Army acknowledges an equal obligation: getting him prepared mentally and physically to return to a useful civilian life, despite his rheumatic disability, is spoken of as " rehabilitation."

After his discharge from the Army the arthritic patient may have to modify the pattern of his life somewhat, so as to avoid factors known to be aggravating to his disease. But he must not alter

his life to the point of engendering defeatism. The educational programme mentioned heretofore is one of our chief weapons against the dangers of a wheel-chair or crutch psychology. The discharged arthritic patient must still regard himself as a vital unit of his community. We, therefore, attempt to teach him how to live with his disease, not for it. As long as possible, the treatment of his rheumatism should be merely an avocation, not his vocation. If, prematurely or needlessly, he makes a vocation of his disease, he has taken a long step toward the sterile existence of the pensioner's rocking chair.

Policies.—Each of the rheumatic diseases poses its own problem in disposition. For patients recovering from acute rheumatic fever the disposition must take into account the presence or absence of rheumatic carditis or the likelihood of its early development. The need for manpower has been such that blanket discharges for rheumatic fever could not be entertained. Dispositions have been individualized.[13] The general policy in force at the rheumatic fever centres has been mentioned.

Most patients with rheumatoid arthritis, certainly those with progressive disease, should be discharged. However, we have attempted to salvage the mildly affected patients whenever possible; otherwise we cannot learn to what extent salvage is feasible or to what extent the Army can utilize the soldier with a clear brain and stout heart, but with slightly rheumatic joints.

The disposition of patients with "psychogenic rheumatism" requires individual consideration. Many soldiers affected with psychoneurosis of mild or moderate degree can still render effective service. But we are ordered to conserve, not men, but manpower. When, despite conscientious treatment, "psychogenic rheumatism" persists to the extent that its victim no longer represents a unit of manpower, then he is recommended for discharge, because a man without power is a drag on the Army.

Statistics on Disposal

For this report we have summarized the methods of disposal in 1,300 cases, not chosen serially, but selected only so as to include a representative number of cases of each of the commoner rheumatic diseases (Table 5). Of the 1,300 patients, 589 (or 45·3%) were returned to duty of some kind, to full duty or to temporary or permanent limited duty; 711 (or 54·7%) were discharged (enlisted men) or retired (officers) from service. Thus about half of the patients were returned for a further trial of duty. In contemplating these preliminary results one must keep in mind the fact that military duty, even limited duty, is pretty strenuous business, unsuited for those who cannot work regularly at least eight hours a day. The concessions that can be made to the rheumatic soldier are limited.

A follow-up study is being made of both groups: of the retained group to note to what extent our attempts at salvage were successful; of the discharged group to note the further course of the disease when the patients were freed from the physical and psychic stresses of Army life.

Table 5.—Disposition of 1,300 Soldiers with Rheumatic Disease at the Rheumatism Centre, Army and Navy General Hospital

Condition	Patients	Returned to duty (full or limited duty).		Separated from Service by medical discharge or retirement.	
		Patients	%	Patients	%
Rheumatoid arthritis, including rheumatoid spondylitis.	500	76	15·2	424	84·8
"Psychogenic rheumatism."	200	128	64·0	72	36·0
Fibrositis, primary ..	150	123	82·0	27	18·0
Osteo-arthritis	100	38	38·0	62	62·0
Rheumatic fever.. ..	50	39	78·0	11	22·0
Gonorrhoeal arthritis ..	20	13	65·0	7	35·0
Gout	10	1	10·0	9	90·0
Miscellaneous and unclassified cases of arthritis and "rheumatism."	270	171	63·4	99	36·6
Total ..	1,300	589 patients = 45·3%		711 patients = 54·7%	

It will be noted that most of the patients with primary fibrositis, "psychogenic rheumatism," rheumatic fever, or gonorrhoeal arthritis were returned to duty, whereas the majority of those with rheumatoid arthritis, osteo-arthritis, or gout were separated from service. Many of our osteo-arthritic patients were elderly commissioned or non-commissioned officers of long service in the Army. In our opinion most gouty patients are not suitable for Army life, considering the difficulties of following a medicinal and dietary regime and the likelihood of encountering provocative physical trauma. Frequent recurrences of acute gouty arthritis make such persons of limited or doubtful military value.

Clinical Investigation

"It is hoped to make this hospital a source of extensive knowledge on arthritis for the whole medical profession. Studies will be carried on in the use of special drugs, such as sulphonamides and penicillin, in the treatment of arthritis": so read the War Department's announcement of the establishment of the first rheumatism centre.[7] Thus the Army acknowledged an obligation to the arthritic soldier, not merely as an individual, but as a representative of all his kind. Thus the medical officers serving at the five rheumatism centres are encouraged to improve our clinical knowledge of the rheumatic diseases, to improve, if possible, our methods of treatment, and to present clearly the results to the medical profession. In an effort to fulfill this obligation a number of clinical investigations are being carried out at each of the five centres. Although quite young, the two centres for chronic

rheumatic disease are already, so far as we know, the largest rheumatism centres in the world. As treatment centres and carefully supervised schools of rheumatology, they are providing a unique opportunity which should benefit mutually both the rheumatic soldier and his medical officer.

Summary

" While arthritis does not account for a large percentage of illnesses in the United States Army, it has been found to be one of the most disabling ": so the War Department has stated.[7] During the First World War about 93,000 American soldiers developed some type of " rheumatism," an incidence rate of 22·4 per 1,000 soldiers. The incidence of rheumatic diseases among soldiers in this, the Second World War, has been such that the Surgeon-General has established five rheumatism centres for selected cases: two for chronic rheumatic diseases, and three for rheumatic fever.

The management of rheumatic soldiers at one of the centres has been outlined. Rheumatoid arthritis, psychoneurosis manifested by musculo-skeletal symptoms (" psychogenic rheumatism "), primary fibrositis, and osteo-arthritis, were the conditions most often encountered. The high relative frequency of rheumatoid spondylitis and of " psychogenic rheumatism " were of special interest. Gonorrhoeal arthritis among soldiers appears to be relatively uncommon: cases of rheumatoid arthritis precipitated or aggravated by acute genital (not articular) gonorrhoea were more often seen. It is believed that many, if not most, cases of so-called gonorrhoeal arthritis resistant to sulphonamides and/or penicillin are in reality cases of rheumatoid arthritis precipitated or aggravated by, or coincident with, an otherwise unrelated genital gonorrhoea.

Psychoneurosis manifested by musculo-skeletal symptoms, " psychogenic rheumatism," has presented a common and difficult problem and affected 15 to 20% of the soldiers, presumably " rheumatic," admitted to the two centres for chronic rheumatism. The recognition of " psychogenic rheumatism " is of importance in military life in order to initiate effective treatment promptly and to prevent unnecessary discharges and pensions for non-existent " arthritis " or " muscular rheumatism." Psychogenic rheumatism must be differentiated, especially from primary fibrositis (muscular or capsular rheumatism). In general, fibrositis puts its victims at the mercy of changes in external environment (weather, heat, cold, humidity, rest, exercise) whereas " psychogenic rheumatism " tends to put its victims at the mercy of changes in internal environment, symptoms being altered for better or worse by changes of mood or psyche, by pleasure, excitement, mental distractions, worry, or fatigue. The clinical differentiation has been outlined briefly.

Of 1,300 " rheumatic patients " disposed of at one of the centres for chronic rheumatism, 45% were returned to some type of military duty; 55% were discharged from Service.

The five rheumatism centres are providing an unusual opportunity to give the rheumatic soldier the best available study and treatment and to advance the knowledge of rheumatic diseases.

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THE CHRONIC RHEUMATIC DISEASES IN THE WORLD WAR 1939–1945

BY

W. S. C. COPEMAN

The chronic rheumatic diseases have played an undramatic role in the medical history of this war. Consequently, comparatively little reference to them is to be found in the available reports of the consultants in medicine in the various theatres of war. There can be no doubt, however, that their "nuisance value" was in the aggregate considerable and at times produced a mild man-power problem in certain regions, whilst the hospital bed situation was also adversely affected owing to the length of the average stay of rheumatic patients in hospital. For information concerning this aspect it is necessary to consult the quarterly reports of the officers in charge of medical divisions of general hospitals; and for the purpose of this account samples of these have been taken and will be referred to below.

Types of Disease

The types of disease at issue are, as would be expected in a selected body of young men, chiefly those of the non-articular group. These are to be found variously classified under such headings as fibrositis, fibromyositis, myalgia, "rheumatism," and even "pain of psychosomatic origin." In addition there are the well-recognized anatomical classifications under such headings as lumbago, sciatica, pleurodynia, torticollis, brachial neuritis, etc.

Incidence

Interest in these conditions is not universal amongst medical men, with the result that information on which to base an accurate estimate of their rate of incidence is widely scattered. Those reports which have been found to be most helpful are reproduced below. The difficulties inherent in the lack of a standardized nomenclature have already been referred to, whilst finally it must be noted that a number of cases were admitted to surgical divisions and retained there, more especially if orthopaedic facilities were available. The number of these cases is known to have been considerable, but is not included in the figures given below. All these factors make it difficult to give an exact picture of the incidence of this disease-group during the late war—although an estimate may be arrived at from a study of the samples given below for the various theatres of operation, since they are believed to be generally representative.

Age Groups

In view of the fact that the Army personnel were a selected group within comparatively limited age limits, little information of value can be extracted with regard to the age-group liability to the various types of rheumatic disease. It becomes evident, however, that the non-articular forms are far from being the prerogative of the middle-aged and ancient, as is sometimes taught. Osteo-arthritis was generally the direct result of trauma, which accounts for its comparative frequency.

Precipitating Causes

The concensus of informed opinion is that the precipitating factors which have seemed principally operative in all theatres have been febrile illness, trauma, and exposure to severe climatic stress, of which cold appeared to be the major element.

Cold, damp, and changes in weather.—The majority of the men at risk were conditioned by long training to withstand a degree of exposure not normally encountered in civil life. Those who reasonably attributed their symptoms directly to exposure described such conditions as night patrols in the snow; sleeping on concrete floors or in slit trenches; lying in mud and wrapped only in a blanket; spending days at a time in wet clothes after crossing rivers; continual exposure to the fierce, damp draught which concentrates on the driver's seat in a Sherman tank; dispatch-riding in all weathers; or wading ashore from landing craft. The common factor in all these experiences is cold with insufficient protection to a degree approaching or exceeding the limit of individual tolerance, either alone or in conjunction with over-exertion, fatigue, or physical strain. Another significant factor appeared to be the variability of the conditions to which forward troops had to adjust themselves. Periods of relatively good living alternated with periods of full exposure to the weather. Sudden changes of weather bringing low temperatures, wind, rain, or snow exerted their full effect on soldiers living in the open without cover. The protection afforded by clothing is lost when the clothes become wet, and in these circumstances, even in relatively warm weather, a man is subjected to considerable cold stress. However well-conditioned a man may be, there are periods in such an existence when he is reduced to a state of shivering misery which is tempered only by his preoccupation with the job in hand.

An attempt to correlate recent physiological observations with the onset of rheumatism precipitated by such conditions was made (Copeman and Pugh, in 113 General Hospital, B.L.A., 1945), and the effect of such climatic conditions on intracellular

tension was shown. It was demonstrated that these changes are reversible by means of dehydration. It seems possible that some therapeutic advance is foreshadowed by this work.

Trauma.—It is generally accepted that the increased mechanization of the Army resulted in a higher morbidity rate from both non-articular rheumatism and osteo-arthritis. This would have been expected from the data generally available from civilian industry prior to the war, and calls for no special comment.

Infection.—Focal infection met with little confirmation as an aetiological cause for the rheumatic syndromes observed in the Army. In a group of young men so carefully selected as were the forward fighting troops, it was a comparatively simple matter to exclude it.

The observation was made (Copeman, 1943) during an epidemic of influenza, that the pain in the back of which these patients complained was referred from trigger points similar in every way to those characteristic of fibrositis. It was observed, moreover, that although in a majority of patients these points disappear during their convalescence, in others they remain, unknown to the patient, until they are reactivated by any subsequent febrile illness or exposure. It seemed that in this way they may prove to be the basis for subsequent chronic fibrositis.

Morbid Anatomy

A considerable amount of work was carried out, largely at the Military Hospital for Head Injuries at Oxford, on the subject of sciatica caused by prolapsed intervertebral discs. It seems to be the general opinion of officers in charge of medical divisions that about 70% of cases seen in their hospitals could be correlated with this lesion, although neurologists are inclined to claim 90–95%. It appears that very few soldiers affected in this way reverted to useful employment in the Army.* Elliot and Kremer also showed that a lesion of the cervical intervertebral discs could be demonstrated in certain cases of brachial neuritis. Elliot, noticing that certain fibrositic " nodules " disappeared as the result of treatment, produced myographic evidence to confirm his view that these lesions were, in fact, local collections of muscle fibres in spasm.

Working in Sicily (33 General Hospital) Copeman and Ackerman (1944) showed by biopsy that the " nodule " in the cases under our care consisted in a local non-inflammatory oedema of the fibro-fatty tissues in certain regions, which might result in herniation of affected fat lobules through their fibrous investment, where this was deficient. They showed that removal of these lobules would cure the pain complained of. These observations were confirmed by Mylechreest working in the same hospital. His findings are published in an M.D. thesis accepted by Cambridge University (1945).

Pugh and Christie (1945) examined 500 healthy soldiers in B.L.A. and found that non-tender nodules could be found in many—equally in rheumatic and in non-rheumatic subjects—but that tender nodules and trigger points were found in only 3% of men who did not give a clear history of fibrositis, as compared with 32% in those who did. Thus it seemed that non-tender nodules can be considered to be of no importance, whilst tender nodules must be correlated definitely with a rheumatic " diathesis."

British Expeditionary Force (to France)

In 1939, at the outset of war, a large number of reservists were recalled to the colours; a number of them being middle-aged men who were not extremely fit. As the result of the fairly primitive conditions in some regions at the outset, a fair number broke down. Dyspepsia seemed to be the principle evidence of this, although " rheumatism " accounted for 15% of all admissions into Nos. 2 and 3 General Hospitals during the first 4 months, and 26% of all medical admissions (Copeman, 1940). The Medical Society of Dieppe Medical Base area, under the Chairmanship of Major-General R. Priest, F.R.C.P., invited the writer in March, 1940, to discuss this matter. He showed that of the first 100 cases of " rheumatism " admitted to No. 3 General Hospital, rheumatic fever accounted for 15% (acute and subacute), chronic polyarticular rheumatism (? infective) for 6%, osteoarthritis for 9%, and fibrositis—mostly first attack attributed to exposure or trauma—for 70%. He demonstrated a primitive but effective field treatment centre in which all the apparatus had been improvised from salvage material. (He was later awarded the gold key of the American Congress of Physiotherapy for this work.)

The experiment of grouping all rheumatic patients into special tents adjoining this centre was tried (Lt.-Col. F. Holmes, O.B.E.) and in spite of adverse factors such as leaking tents and the coldest winter for many years, the results of therapy at once improved. This was attributed to the active co-operation of the patients, which was obtained as the result of the increased interest and activity which this system produced in the nursing and medical staff concerned.

In June, 1940, Stott and Copeman published a paper describing 27 cases which had mostly been thought to be rheumatism. They were able to show conclusively that these were actually suffering with chronic meningococcal septicaemia, and further, that such cases, although comparatively rarely diagnosed as such, are in fact not uncommon.

The high admission rate for rheumatism was beginning to fall during the two months (April, May) which preceded the Army's evacuation of France in 1940.

Middle East Force

The consulting physician to this Force (Brigadier W. D. D. Small), discussing the subject of " rheumatism " in his report for the quarter ending Sept. 30, 1940, stated that rheumatism following rheumatic fever was " of a more chronic type than

* In response to a questionnaire circulated privately.

that seen in civilian practice at home. Small joints were more frequently affected, whilst cardiac complications were thought to be fewer, especially with first attacks. It did not respond to salicylates." In April, 1942, he held a conference in Cairo to which all officers in charge of divisions and many medical specialists were summoned. In opening this he stated that the subject of rheumatism in the Middle East needed discussion since the general conclusion which had been reached by his predecessors was that, whilst it was probable that the types of rheumatism seen in Egypt were essentially the same as those seen at home, it would seem probable that there were certain local variations in their clinical features or course. Rheumatism, in the wider sense, was, he said, the cause of a great deal of illness requiring admission to hospital, and in Egypt the acute forms did not respond well to salicylates.

Lt.-Col. I. W. G. Hill had formed the impression that rheumatism of all forms was commoner in Palestine than in Egypt, and that it accounted for a considerable wastage in manpower. The high incidence of these diseases was, he said, acknowledged by the civilian authorities in Jerusalem. Captain J. H. L. Easton emphasized the frequency of sciatica and fibrositis amongst Libyan prisoners of war.

Lt.-Col. J. C. Hawksley agreed that clinical types might be expected to vary in different localities, as did certain factors which might be expected to influence them. In the Suez area the incidence was low. Out of 12,500 admissions in the year ending March 31, 1942, only 1·33% were rheumatic. These cases averaged 25 days in hospital. He pointed out that, if the figures for cases treated at M.I. rooms and O.P. Department were included, it would be seen that " these minor cases form a big problem of their own." He pointed out that many were probably admitted to surgical divisions and were retained, more particularly those cases of sciatica in association with the typical fibrositic syndrome, which had occurred rather frequently amongst certain types of worker, especially railway-men and lorry drivers.

At this conference the syndrome was first reported which eventually became so well known in this theatre of operations: the triad of arthritis, conjunctivitis, and non-venereal urethritis—believed to be a late result of bacillary dysentery. It was stated that these cases generally healed, but that they might progress to chronic arthritis. One case, which had developed florid rheumatoid arthritic deformities, was described. Lipscomb and Sydney Smith stated that they had never previously seen this syndrome during long service in India.

Major M. Sarwar, I.M.S., reported that, although rheumatism of all forms was relatively uncommon in India, " it had been a great problem amongst Indian troops in Middle East during the last year."

Lt.-Col. C. C. McDonald commented on " the large problem of chronic rheumatism and fibrositis amongst Australian troops " which caused a serious wastage. He regarded an anxiety neurosis as a frequent aetiological factor, and it was in his view encouraged " by indulgent orthopaedists and physicians." Lt.-Col. E. Bulmer stated that, of 1,750 medical cases admitted during the previous quarter, 101 were for fibrositis. Many of these cases had developed the condition for the first time after lying in damp forward surroundings. He also found it excessively commonly complained of amongst Cypriot labour battalions.

Subsequent to this no further reference to the rheumatic diseases is to be found in the reports of the consulting physician. With a view to estimating the incidence of these diseases subsequently, the quarterly reports of the officers in charge of divisions have been perused and an abstract is appended from the two in which most information is to be found, i.e. No. 19 General Hospital and No. 2 General Hospital, when they moved to Tripoli in 1943.

The impression gained from reading the reports is that treatment in this disease group was seldom adequate, for the following reasons: the hurried examination and often inaccurate diagnosis given by the first medical officer to see the case—this was often an R.M.O. in a forward area; the lack of interest in these cases, as opposed to acute or rarer forms of disease; the frequent need to transfer cases from one hospital to another on account of the military situation; and, finally, in some cases, the absence of suitable physiotherapeutic apparatus.*

MIDDLE EAST

No. 19 *General Hospital*, Tripoli
(Lt.-Col. J. G. Scadding)

April–June, 1943.
Total medical admissions, 2,800.
Arthritis: acute, 6.
,, subacute, 11.
,, monarticular, 13.
Fibrositis, 29.
Sciatica, 8.
Total prisoner-of-war admissions, 928; " rheumatic," 10.
Of 143 Medical Boards, 11 were on account of " rheumatism."
Of 120 out-patients seen, 13 were for " rheumatic " diseases.

July–September, 1943.
Total medical admissions, 2,600.
Polyarthritis: acute, 11.
,, subacute, 20.
Arthritis, monarticular, 6.
Fibrositis (mostly lumbago), 21.
Sciatica, 7.
Spondylitis, ankylosing, 1.
Of 99 Medical Boards, 8 were on account of " rheumatic " diseases.
Of 59 out-patients seen, 4 were for " rheumatic " diseases.

October–December, 1943.
Total medical admissions, 2,839.
Polyarthritis: acute, 11.
,, subacute, 2.
Arthritis, monarticular, 5.
Fibrositis (lumbago), 33.
Sciatica, 5.
In addition, 6 prisoners-of-war were admitted with " rheumatism."
Of 142 Medical Boards, 6 were on account of " rheumatic " diseases.
Of 68 out-patients seen, 5 were " rheumatic " diseases.

* Also a questionnaire circulated privately to officers in charge of divisions.

January–March, 1944.
Total medical admissions, 1,900.
Polyarthritis: acute, 14.
,, subacute, 7.
Arthritis, monarticular, 8.
Fibrositis and lumbago, 39.
Sciatica, 8.
Synovitis, acute, 3.
Spondylitis, ankylosing, 1.

April–June, 1944.
Total medical admissions, 1,588.
Polyarthritis: acute, 16.
,, subacute, 5.
Arthritis: monarticular, 6.
,, gonococcal 1.
Fibrositis (and lumbago), 29.
Sciatica, 3.
Synovitis, 1.
In addition, acute rheumatism was seen in two West African native soldiers, and fibrositis in one.

July–September, 1944.
Total medical admissions, 3,770.
Acute rheumatism, 8.
Subacute rheumatism, 10.
Fibrositis, lumbago, etc., 22.
Osteo-arthritis, 5.
Sciatica, 4.
Spondylitis, 2.

Case history: West African soldier, aet. 25. (Pyomyositis tropica.) Onset of general muscular pains one month previously. Gradual appearance of small, ill-defined, slightly tender, firm lumps in right triceps and quadriceps muscles. General condition, good. Further nodules had recently appeared in right latissimus dorsi and left quadricepts. He was admitted to hospital. On examination he had mild fever. Pulse was 72. White cells, 11,000 per 100 c.mm. of blood. (Polymorphs 72%.) Kahn ±. All other examinations were negative. The nodules in latissimus dorsi were punctured, and a little sanguino-purulent material was obtained. Haemolytic *Staph. aureus* was grown on culture. The patient made an uneventful recovery after 75 g. sulphapyridine, and nodules disappeared.

October–December, 1944.
Total medical admissions, 2,700.
Acute rheumatism, 15.
Subacute rheumatism, 6.
Fibrositis, 21.
Osteo-arthritis, 6.
Rheumatoid arthritis, 3.
Sciatica, 13.
Synovitis, 1.

As can be seen, the group was not a very large problem on account of size, but has made up for this on account of refractoriness to treatment. One group of cases might be noted. This was one of 33 cases of polyarthritis occurring between July and October, 1943. All these men came from the desert and had been living in tents. Usually knees, ankles, wrists, and elbows were affected, but not infrequently the small joints of the hands were attacked as well. Pain was a more noticeable factor than swelling. The cyclical involvement of acute rheumatism was not noticeable, but the arthritis, nearly always multiple, persisted for some time and responded poorly to salicylates. Pyrexia tended to be slight but persistent, and tachycardia was moderate. No case of carditis was seen, and there was no enlargement of lymph nodes. Search for focal sepsis was unproductive. A past history of acute rheumatism was rarely obtained, but previous joint pains had been fairly frequent. Those affected were rarely discharged from hospital in less than 6 weeks. The erythrocyte sedimentation rate was considered to be the most useful guide to progress.

No. 2 General Hospital, Tripoli
(Lt.-Col. H. R. Donald)

April–June, 1943.
Total medical admissions, 4,300.
Rheumatic diseases, subacute and chronic, excluding neuritis, 143.
Acute rheumatic fever, 8.

July–September, 1943.
Total medical admissions, 5,000.
Rheumatic diseases, subacute and chronic, 98.
Acute rheumatic fever, 10.

October 1st–25th, 1943.
Rheumatic diseases, subacute and chronic, 21.
Acute rheumatic fever, 10.

An appendix to one of the reports of the advisor in physical medicine to the Middle East (Lt.-Col. G. Kersley) is worth quoting for the total figures included for the various countries comprised in this Command :

" *Rheumatic Diseases in M.E.*, 1943–44.

" A review of all available statistics on ' rheumatic ' cases from Military Hospitals in M.E. covering the period of 18 months has been carried out. In considering the findings, the following factors must be borne in mind: (*a*) the movement of troops and convoys of wounded from one locality to another; (*b*) inexactitude in terminology in many cases; (*c*) the Palestinian temperament; (*d*) climatic conditions.

" Among the cases of acute rheumatism are probably included many cases of acute non-traumatic synovitis of doubtful aetiology seen so frequently in the hot weather and which resemble rheumatic fever except for the absence of cardiac sequelae. Under arthritis, unless specifically noted, are included cases of rheumatoid, infective and osteo-arthritis, and also the syndrome of non-specific urethritis, conjunctivitis, and arthritis.

" *Incidence of rheumatic diseases* admitted to hospital, including fibrositis and sciatica, in comparison to the total medical admissions:

Egypt	637 cases out of 28,670, i.e. 2·2%.
Palestine and Syria ..	389 cases out of 13,000, i.e. 2·9%.
Tripolitania and Malta	262 cases out of 10,170, i.e. 2·6%.
Total	1,288 cases out of 51,840, i.e. 2·5%.

" *Seasonal Incidence:*

January–March (incl.)	189 cases out of 3,670 i.e. 5·1%.
April–June	537 cases out of 16,470, i.e. 3·2%.
July–September ..	267 cases out of 13,800, i.e. 1·9%.
October–December ..	119 cases out of 4,520, i.e. 2·6%.

" *Types of Rheumatic Diseases:*

Acute rheumatism	250
Arthritis	164
Fibrositis	253
Sciatica	108

" Of 199 cases grouped as arthritis, 18% were classed as osteo-arthritis."

CENTRAL MEDITERRANEAN FORCE

No. 33 *General Hospital*, Sicily
(Lt.-Col. W. S. C. Copeman)

January–March, 1944.
Total medical admissions, 2,662.
Fibrositis (gluteal, 60; lumbar, 38), 105.
Subacromial bursitis, 1.
Sciatica, 13.
Polyarthritis: acute, 14.
,, infective, 2.
Synovitis, 3.
Spondylitis, ankylosing, 3.
Osteo-arthritis, 3.
Rheumatoid arthritis, 2.
Arthritis, gonococcal, 3.

Extracts from Accompanying Report.—" At this period the 8th Army were crossing the Straits of Messina after a campaign through Sicily entailing great hardship and exposure. Large convoys were received from casualty clearing stations and field ambulances in forward areas; and the hospital itself functioned as a C.C.S. for half this period. In more normal circumstances, some of these cases might not have been evacuated to a base hospital. In view of the urgent need to free beds, the non-articular cases were treated energetically from the first by means of procaine injection and manipulation, with the result that the number who could not be returned to full duty within 12 days was very small. Some cases of typical fibrositis were observed to develop pain in the distribution of the sciatic nerve, and this was considered to be a more common cause in this series of sciatica than prolapse of an intervertebral disc."

(Lt.-Col. W. L. Ackerman)

April–July, 1944.
Total medical admissions, 2,094.
Fibrositis: lumbar, 39.
,, gluteal, 9.
,, shoulder girdle, 1.
,, intercostal, 7.
,, miscellaneous, 8.
Gluteal plus sciatic pain, 8.
Lumbar plus sciatic pain, 1.
Sciatica: fibrositic, 6.
,, disc, 2.
Arthritis: acute polyarticular, 11.
,, infective polyarticular, 5.
,, serum, 1.
,, osteo-arthritis, 4.
,, rheumatoid, 1.
,, spondylitis, ankylosing, 4.

July–September, 1944.
Total medical admissions, 2,078.
Fibrositis: lumbar, 19.
,, gluteal, 4.
,, miscellaneous, 4.
Fibrositis with sciatic pain reference, 24.
Synovitis, 5.
Polyarthritis, acute, 11.
Osteo-arthritis, 4.
Old Perthe hip, 1.
Spondylitis, ankylosing, 1.
Postural pain, 3.

Extracts from Accompanying Report.—" Fibrositis and mild referred sciatic pain has ousted dyspepsia, diarrhoea, and headache as the chief cause of frequent and prolonged hospitalization. Most of these patients have been in several hospitals—average two months—and by the time we see them the residual pain and intensity is difficult to estimate owing to the impaired functional background. The man at this stage is often reconciled to being a chronic case. It is suggested that more efficient results would be obtained if these ' rheumatic ' patients could be referred to one hospital for all investigation and treatment; and, if mild pain persisted after a certain time, a decision other than to transfer him to another hospital might be agreed upon, if necessary the medical category being lowered temporarily."

No. 45 *General Hospital*, Malta
(Lt.-Col. R. E. Tunbridge and Major W. A. Dewer)

July–September, 1943.
Total medical admissions, 1,488.
" Arthritis," 1.
Fibrositis and lumbago, 14.
Sciatica, 4.
Neuritis, 4.
" Rheumatism," 8.
O.P. Dept., Total 308.
Osteo-arthritis, 3.
Sciatica, 5.
" Rheumatism," 4.
Fibrositis and lumbago, 13.
Neuritis, 4.

(Lt.-Col. J. Halliday Croom)

October–December, 1943.
Total medical admissions, 1,117.
Acute rheumatism, 7.
Fibrositis, 23.
Infective polyarthritis, 6.
Osteo-arthritis, 2.
Of 11 Medical Boards, 2 were on cases of rheumatic diseases.
Of 7 cases evacuated to U.K., one was for fibrositis. In addition there was one naval patient with severe sciatica.

January 1st–February 23rd, 1944.
Total medical admissions, 131.
Acute rheumatism, 1.
Subacute rheumatism, 4.
Lumbago, 3.
Synovitis (acute), 2.
O.P. Dept., Total 56.
Subacute rheumatism, 3.
Fibrositis and lumbago, 11.
Osteo-arthritis (spine), 2.
Of 10 Medical Boards, 3 were on cases of rheumatic disease.
No cases were evacuated to U.K. for this cause.

April–June, 1944 (in Italy).
Total medical admissions, 879 (379 Yugoslavs).
" Rheumatism ": British, 16; Yugoslavs, 17.

GIBRALTAR

Precise figures were not available, but an unofficial report from Lt.-Col. L. Howells (officer-in-charge of

medical division, Military Hospital, Gibraltar, 1941–1943) may be quoted as being his subsequent impression of the problem presented by the chronic rheumatic diseases:

" We certainly found fibromyositis a problem at Gibraltar. My recollection is that we found it a common and a difficult complaint to treat and we had to evacuate a large number of such cases. We attributed this to the humid atmosphere of the Rock, especially during the periods when the ' Levanta ' enshrouded the Rock. Old ' rheumatic ' subjects who had kept their symptoms in abeyance for years found that they relapsed soon after arriving in Gibraltar and that they soon improved after leaving. Chronic arthritic manifestations and acute rheumatic fever were not common. Apart from the climatic factor, I have little doubt that the mental stress consequent upon the peculiar conditions associated with service in war-time Gibraltar, and a consequent desire to get away, played some part in the relative frequency of fibromyositis. In other words, in some it was a psychosomatic manifestation."

British Liberation Army
10 C.C.S.
(Major J. Ranking)

September, 1944–*April*, 1945.
Total medical admissions, 3,096.
Chronic muscular rheumatism, 157.
Sciatica, 38.
Rheumatoid arthritis, 2.
Osteo-arthritis, 2.

Note by Major Ranking.—" Soldiers of good temperament appeared to recover fairly quickly under adequate treatment, but in a large number of cases downgrading to a lower medical category appeared to be the only solution."

No. 101 *General Hospital*
(Lt.-Col. G. Mitchell Heggs)

August–September, 1944.
Total medical admissions, 665.
Rheumatoid arthritis, 1.
Osteo-arthritis, 1.
Non-articular fibrositis, 15.
Other types, 3.
Acute and subacute rheumatism, 2.

October–December, 1944.
Total medical admissions, 1,214.
Rheumatoid arthritis, 1.
Osteo-arthritis, 1.
Spondylitis, 4.
Unclassified, 4.
Fibrositis, 44.
Prolapsed disc, 17.
Other types, 2.
Acute and subacute rheumatism, 4.

anuary–March, 1945.
Total medical admissions, 1,910.
Rheumatoid arthritis, 8.
Osteo-arthritis, 10.
Spondylitis, 3.
Unclassified, 4.
Fibrositis, 68.
Sciatica, 9.
Prolapsed disc, 6.
Other types, 2.
Acute and subacute rheumatism, 8.

April–June, 1945.
Total medical admissions, 1,846.
Infective and rheumatoid arthritis, 22.
Osteo-arthritis, 8.
Fibrositis, 68.
Sciatica (disc), 31.
Acute and subacute rheumatism, 17.

Note by Lt.-Col. Mitchell Heggs: " Fibrositis became a very common complaint in the autumn in Normandy, and increased throughout the winter of 1944–45. The incidence of sciatica seemed to me to be particularly large in this theatre as compared to Middle East and Italy, although I have no figures to prove this."

No. 8 *General Hospital*
(Lt.-Col. J. Osborne)

The consolidated figures for three quarters were available. Of 10,144 medical cases admitted, 484 were on account of chronic rheumatic diseases and were divided as follows:

Muscular rheumatism, 265.
Sciatica, 118.
Infective arthritis, 60.
Osteo-arthritis, 34.
Spondylitis, 7.

P.A.I. Force
(Persia and Iraq Force—later P.A.I. Command)

In the consulting physician's report for January-June, 1944 (Brig. F. M. Lipscomb), there is a paragraph under the heading of fibrositis: " The group consisting of fibrositis, myalgia, and allied conditions is remarkably small, with an incidence of only 1·7% of all hospital admissions for the half year. These figures are in marked contrast to those seen in the United Kingdom and are interesting in view of the extreme climatic changes in this Command, where cases of frostbite and heat stroke may both be seen during the same half year, and a daily temperature swing of over 40° F. is not uncommon. The rainfall, however, is, as a whole, low."

In the subsequent report for July–December, 1944 (Brig. T. C. Hunt), the admission rate for this group is given as 0·5 per 1,000 per month. He comments on the number of cases of neuritis which had been seen in this half year. These cases were characterized by an acute onset with severe pain, followed in 2–3 weeks by weakness and wasting, usually in the shoulders. Sensory loss was variable, but generally slight, and it was the supra-scapular and serratus muscles which were most generally involved. Indian troops appeared to be more frequently affected than European troops. He is undecided as to the aetiology of these cases, which were similar to many others reported from Middle East from 1940 onwards, but inclines to an infective (? virus) origin, although the rapid response of certain cases to thiamine suggested the possibility of a dietetic or vitamin deficiency. He pointed out with regard to the fibrositic group of cases that these had increased in the late summer and autumn and were reported equally amongst Indian troops.

This Command was not popular as a place of residence amongst the troops, and the question of a psychosomatic basis for some of these cases became of importance. Indeed, Major St. John Brooks, at

the Lahore Conference in May, 1944, speaking on neurosis in Iraq, stated that all psychosomatic complaints increased rapidly after the first year of residence in the country, and instanced "fibrositis" and "sciatica" as examples amongst British soldiers. Lt.-Col. Bhalla, speaking of Indian "other ranks," mentioned the common occurrence amongst them of "such manifestations of hysteria as backache or sciatica, the part affected being usually the one which will make the individual unfit for his job if he is dissatisfied with it."

The only analysed record from a general hospital concerning this group is for the quarter, January–June, 1943:

No. 33 General Hospital, Mussaiyib
(Lt.-Col. W. S. C. Copeman)

January–June, 1943.
Total medical admissions, 781.
Fibrositis, 36.
Osteo-arthritis, 3.
Spondylitis, ankylosing, 2.
Rheumatoid and infective arthritis, 3.

A note appended to these figures records the observation that many of these cases of fibrositis appeared to have had their origin in acute illnesses of various sorts. Their average stay in hospital was 25 days with active treatment.

East African Command

Chronic rheumatic diseases were not common in this Command, although the consulting physician (Brig. E. Cullinan) stated that a large number of the native troops suffered with pains of unknown aetiology (often thought—with no evidence—to be due to a yaws infection) for which they were, however, seldom admitted to hospital. The following figures of admissions in chronic rheumatic group are from his official reports.

Rates of admission per 1,000 total strength:

Bones, Joints, Fascial, etc.

1944	Europeans	Non-Europeans	All races
January–April ..	3·12	2·0	2·12
May–July	2·81	1·64	1·76
July–September ..	2·44	1·39	1·49
September–December	3·50	1·31	1·54

He records a syndrome which was commonly observed amongst African troops. Onset was with high fever lasting for only a few days. It was associated with pain in one or both sides of the neck and remarkable rigidity of the posterior cervical muscles, which were extremely tender. Occasionally there were some enlarged glands in the posterior triangle of the neck; but there was no evidence of superficial thrombosis. This syndrome often gave rise to chronic cervical pain for many months. Troops boarded to category B or C, diseases of the bones and joints, represented 13·3% in Europeans and 2·5% in African natives.

India and S.E.A.C.

The chronic rheumatic diseases were not much trouble in these commands according to the Consulting Physician, Brig. H. L. Marriott. He wrote (personal communication): "Perhaps I should put the position more accurately if I said that the main tropical diseases—malaria, dysentery, sprue, etc.—bulked so largely that all other problems seemed small by comparison." The figures from the two annual reports of the Standing Medical Review Board at Poona, issued by Brig. J. D. S. Cameron, confirm this on the whole, although, since the figures refer only to cases evacuated back to the United Kingdom out of India from these two Commands, it would seem that the reservoir from which they were drawn may have contained a considerable total number of cases suffering from this group of diseases. It is interesting to find that Brig. Cameron specifically mentions that dysenteric arthritis was no problem in this war: "Its very low incidence was one of the rather unexpected findings of tropical disease in the India Command, contrary to what the book said."

The figures referred to above have been extracted from his reports for the years 1944 and 1945 and are as follows:

Standing Medical Review Board

1944.—Total cases, 3,261.

Fibrositis and bursitis	10
Neuritis	12
Sciatica	9
Arthritis	52
Spondylitis (deformans and adolescent)	15
,, (ankylopoetica)	12
Gout	1
Total	120

The total number of rejections during this year on account of chronic "rheumatic" complaints was 29 out of a total of 262.

1945.—Total cases, 8,812.

Fibrositis and bursitis	20
Polyneuritis	9
Neuritis	19
Sciatica	28
Rheumatism	9
Arthritis: polyarthritis	8
,, infective	23
,, osteo-	57
,, osteochondritis	7
,, rheumatoid	37
,, sacro-iliac	7
Spondylitis (deformans)	19
,, (ankylopoetica)	21
Total	264

My thanks for permission to publish this section of the "Medical History of the War" are due to Major-General Sir A. G. Biggam, Sir Arthur MacNalty, and Dr. Charles Newman.

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CHRONIC RHEUMATIC DISEASES FROM THE SERVICES IN E.M.S. HOSPITALS

BY

C. W. BUCKLEY

This survey of chronic rheumatic diseases in the Services is limited to cases which have been deemed suitable for treatment by physiotherapy in certain spa hospitals under the Emergency Medical Service of the Ministry of Health. The selection of cases depended largely on the views of the medical and surgical staffs of the Service hospitals and depots at which the cases were first received for treatment. It follows that many cases were received from some, and few or none from others. While the selection depended in some degree upon the availability of physiotherapeutic treatment in the various military hospitals, it was also affected by the extent of the experience of rheumatic diseases and the most effective methods of treatment possessed by the medical officers and the Medical Boards concerned. Unfortunately patients were often detained in general hospitals, and there for many weeks underwent treatment by heat and massage. Many such patients would have recovered more quickly in a hospital specially equipped for physiotherapy, where they would not have been confined to bed, and where systematic exercises adapted to the case would have been a feature of the treatment. These factors make it impossible in any way to correlate the numbers treated with the numbers at risk.

Patients came from all branches of the Forces and were treated in two hospitals, one being reserved for officers and the other for N.C.O.s and privates. Cases were also received from the W.R.N.S., the A.T.S., and the W.A.A.F., and from the nursing services. Cases received for treatment at the two hospitals from the beginning of 1940 to the end of 1945 numbered 1,497, of whom 226 were commissioned officers, and the remainder other ranks ; 52 were from the women's Services. During the latter half of the time, half the beds previously reserved for rheumatic cases were taken over for the treatment of peripheral nerve injuries by reason of the facilities available for their physiotherapeutic treatment. These cases are not taken into account in this survey.

Diseases Treated: Causes and Contributory Factors

A certain disparity is to be noted which is largely attributable to the fact that the cases among other ranks were under the care of different medical officers, whose views on diagnosis and nomenclature were not always the same.

Fibrositis—a somewhat loose designation, including conditions differing both in aetiology and pathology and having in common only the symptoms of pain and stiffness and the localization of the trouble in the fibrous tissues—accounted for the largest proportion of the cases which were sent for treatment.

Classification of admissions: percentage

	Officers	Other ranks
Subacute rheumatism ..	4	4·5
Fibrositis	35	52·5
Lumbago	—	4·5
Sciatica	15	12·3
Rheumatoid arthritis ..	19	19
Osteo-arthritis	6	1·3
Spondylitis	9	1·1
Synovitis	—	2·0
Pes planus	—	1·5
Gout	5	0·4
Other diseases	7	0·9

The results of treatment were affected in some measure by the fact that, among the " other ranks " more particularly, there were two categories which tended to reduce the general average of recovery: (1) men from the reserve, many of whom had served in the last war and were at an age when their capacity to stand up to prolonged physical strain was deficient; and (2) a fairly large number who had been passed by recruiting boards but who, from various causes, had broken down in training. Some of the latter had " gone sick " within a week or two of being called up, and others had been in and out of hospital for months—in a few cases for more than a year—generally with very indefinite complaints. The truth of the saying that malingering is rare but exaggeration is common was frequently illustrated, and it cannot be denied that the disease which was once described by an eminent surgeon as *miles antiquis* was not unknown. A good many cases of these types were sent for out-patient treatment from a depot of Pioneers in the neighbourhood. They were mainly men of low category, and complained of stiff and painful backs and shoulders, flat feet, etc. Often they had histories of old injuries in civil life, though they had little or nothing in the way of objective evidence to explain their symptoms. These were very unsatisfactory cases to treat. It appeared likely that some were psychosomatic or psychoneurotic in nature, but a psychiatrist was not available to investigate them from this standpoint.

It was perhaps inevitable that the tendency of recruiting boards to treat chronic backache as a merely neurotic, or as a shirker's, complaint, led

to many men being taken into the Services who were a liability from the first. Cases with a clear history of serious accident to the back in previous years were met with, and also a few cases of well-marked adolescent kyphosis. Complaints of pain in the lumbar and sacral regions frequently presented a difficult problem in diagnosis; on clinical examination there might be no objective evidence beyond, perhaps, some limitation of forward bending or a flattening of the normal lumbar curvature, possibly with spasm of the erector spinae which, without eliciting pain, could be corrected with the patient in the supine posture. In such cases it was difficult to be sure that the trouble was not one of defective posture, and that physical training—so far from being inadvisable—might not prove of permanent benefit to the recruit.

In the majority of cases of fibrositis sent to these hospitals the cause appeared to be physical strain, or exposure, or a combination of both. In a smaller number there was a history of some infection, though the causal relation was not always clear. A great variety of infections were noted, the most common being a history of an attack of subacute rheumatism, tonsillitis, otitis media, and dysentery; among the others might be noted chronic appendicitis, colon bacilluria, amoebiasis and non-specific urethritis. In some cases with a history of strain, *x*-ray examination revealed congenital defects, most commonly sacralization of the fifth lumbar vertebra. This latter defect appears to be a common predisposing factor in strain—especially unilateral strain; but in view of the frequency with which this abnormality is met with in radiography of the vertebral column undertaken for other purposes, its relationship cannot be regarded as certain.

Periarthritis of the shoulder—often called brachial neuritis—has been included with fibrositis and was usually associated with strain.

Cases of the psychoneurotic or psychosomatic type described by Halliday and by R. G. Gordon were met with, but were not numerous. As no psychiatrist was available, the ordinary physical methods of treatment were used, with good results in the milder cases. A psychological element leading to exaggeration of symptoms—specially in cases where long-continued strain and exposure had reduced the morale and general powers of resistance—might often be present, but was usually amenable to treatment and rest.

Heavy lifting, starting up heavy motors from cold, and similar efforts were clearly the exciting cause in many instances. Strain from lifting appeared to be the most common cause of lumbar fibrositis in the nursing services. The rigid and flattened spine which is common in these cases led sometimes to the patient arriving with a diagnosis of ankylosing spondylitis.

Fibrositis due to exposure can usually be effectively treated by heat and massage, which are available in most of the military hospitals. Only the more obstinate cases, in which there was commonly some other aetiological factor, were transferred to physiotherapy centres. Thus no statistical conclusions about the relative proportion of the different aetiological factors can be drawn from the cases treated in these hospitals. The researches of Copeman and Ackerman (*Quart. J. Med.*, 194, **13**, 37) and of Mylechreest (this Journal, 1944–5, **4**, 77) have thrown a good deal of light on a difficult subject, and it is likely that many cases which would otherwise have been sent to the special centres for physiotherapy were, in consequence, treated in military hospitals by the methods of these authors. The fact may thus be explained that exposure was less often than in the last war alleged to be the cause of fibrositis and other rheumatic conditions, and that strain was more frequently deemed responsible. Changed conditions of warfare furnish a further explanation. The absence of trench life and the enormous increase in mechanical transport had their effect; conditions incidental to tank warfare were often blamed for myalgic disorders. In the Army, sleeping on wet ground, and, in the Navy, long immersion after being wrecked, although of frequent occurrence, seem rarely to have given rise to serious rheumatism of chronic type.

It seems probable that troops serving abroad were in much harder training and were better fitted to stand exposure in the later stages of this war than in 1914–18. The impression was formed that there were more cases of fibrositis among men training in this country who had never been abroad than in those returning from foreign service; but this observation remains to be tested later, when records are complete.

Aetiological factors in fibrositis: percentages, officers only

Exposure		30
Traumatic causes	27·5	
Trauma plus congenital defects	5·5	33
Infective		26·4
Psychoneurosis		4·6
Unclassified		5·5

Sciatica

There were many cases of sciatic pain; and, of these, 30% showed definite evidence of prolapse of an intervertebral disc. In about an equal number there were grounds for suspecting that this might be the case. Of the remainder, the majority were due to fibrositis of the lumbo-sacral ligaments and gluteal muscles, and in about one-third of these *x* rays showed the presence of some congenital abnormality, as described in the section dealing with fibrositis. The cases in which there were indications of a disc lesion were transferred to orthopaedic or neurological centres. The remainder were generally effectively treated by physiotherapy; the methods will be described later. It is probable that many cases due to a prolapsed disc were recognized in the general hospitals and transferred to special hospitals directly, so that the percentages given above may be too low.

Subacute Rheumatism and Rheumatoid Arthritis

A small number of cases were admitted for treatment of stiffness of joints following subacute rheumatism; there were in addition a few cases with a history of pain and swelling in the joints, the pain moving from one joint to another over a period of several weeks or months. There would be a history of moderate fever at the onset, and an accelerated sedimentation rate. Salicylates had little effect beyond relieving pain. In several cases sulphonamides had been given—also without benefit—while the patients were in general hospitals. There would be remissions and recurrences with the same symptoms, and the condition would gradually become chronic, settling in the proximal phalangeal joints, in the wrists, and sometimes in the knees or other joints—presenting the picture of a true rheumatoid arthritis. At this stage the sedimentation rate had generally become normal, and the joints, though thickened, showed no sign of breaking down or of ankylosis; though from contraction of the capsular ligaments there was generally some restriction of movement, as in closing the fist. Otherwise, recovery tended to be complete, and so far as could be traced no further development occurred. While such cases might be regarded as true rheumatoid arthritis, they were clinically different from the usual type; there was no cardiac involvement in most cases. The writer met with similar cases in civil hospital practice before the war—chiefly in young male adults—and Professor Noah Morris recently stated in a personal communication that he had met with several cases of the same type and had come also to the conclusion that they represented a link between rheumatic fever and rheumatoid arthritis; no infective foci were identified.

There were many cases of rheumatoid arthritis of the more common kind. These usually made good progress, and many returned to duty—though in a lower category. Gonorrhoeal arthritis was rarely seen, probably because it was recognized and treated in special hospitals. In a few cases there was a history of gonorrhoeal infection some years earlier, but the arthritis was probably not gonococcal. In two cases there was a history of non-specific urethritis. Dysenteric arthritis was less common than in the 1914–18 war. In several cases there was a history of malaria, but it did not appear to have any direct association with the arthritis. Vaccines were not used, and gold only in a few cases of the more severe type. The effect of rest in favourable conditions, and of physiotherapy, were in many cases sufficient.

Spondylitis

The incidence of ankylosing spondylitis showed a marked increase compared with civilian practice before the war. It was not usually of the adolescent type so far as age of incidence was concerned, and probably for this reason was less acute and rapidly progressive. There were no cases in women. There was frequently a history of jarring of the spine, but since this must have been a very frequent experience in war conditions, without any after effect, its aetiological significance is doubtful. *X* rays generally showed the greatest degree of bony change to be in the lowest dorsal and upper lumbar vertebrae. The sacro-iliac joints were affected, but to a less pronounced degree than in the more acute form of adolescence; and osteoporosis was less marked. The figures available for age incidence among the "other ranks" are incomplete, but the following from the records of cases among officers serve to indicate the general age incidence:

Total number of cases among officers	Age at onset			
226	20–25	25–30	30–35	35 and above
Cases of spondylitis	9	4	5	2

In the later stages of the war many cases were sent for physiotherapy after a course of deep *x*-ray treatment, and these did well. Many cases recovered sufficiently to remain in the Services in a lower category.

Osteo-Arthritis

Among the older men osteo-arthritis as a late effect of chronic strains, synovitis, and fibrositis of the ligaments—especially of the spine—was a frequent cause of disability requiring physical treatment. The presence of small osteophytes of the vertebrae detected in *x*-ray examination in men complaining of painful backs appeared frequently to have been regarded as pathological and a form of spondylitis. The fact that such a condition may almost be regarded as a normal occurrence in men of middle age who have followed occupations demanding much muscular effort appeared to be generally unknown. The symptoms complained of in such cases probably had no relation to the *x*-ray appearances, and were due to strain and fibrositis. Treatment by the usual physiotherapeutic methods led generally to recovery and return to duty, but in some cases, where the patient had become aware of the results of the *x*-ray examination, he tended to regard himself as permanently disabled and to behave accordingly.

Gout

Gout accounted for a small percentage of the total admissions, and appeared to be relatively more common in the Navy than in the other Forces. It presented no unusual characteristics, and complete recovery was the rule.

Other Diseases

Among the other conditions treated, sacro-iliac and lumbo-sacral strain, chronic synovitis, flat foot, and metatarsalgia were the most common, and

do not call for any special description. They formed only a small proportion of the whole number.

Methods of Treatment

As a routine measure in all suitable cases, warm immersion baths with hot underwater douching were used for the treatment of painful and stiffened joints and stiffness due to fibrositis. These were preceded in some cases by general vapour baths, and in a large proportion by the application of hot peat packs to the affected joints. A development of the simple immersion bath was the deep pool, in which an operator accompanied the patient into a large pool bath of warm water, and carried out passive movements with local hot douching, encouraging such active movements as the patient was capable of, and which were more easily carried out when the limbs were supported by water. This method was especially useful for stiffness of the larger joints and for ankylosing spondylitis. Very crippled patients could be lowered into the baths by means of a crane. Massage under water in a shallow bath also proved an effective and popular method of treatment for chronic fibrositis, lumbago, and strain of the back. In suitable cases the treatment went on to immersion in a tepid swimming bath in which swimming and other movements could be freely practised.

Whirlpool baths were used—often alternately with the methods mentioned above—for local treatment of painful and stiffened joints, and also for disorders of the peripheral circulation, trench foot, Raynaud's disease, and chronic oedema from various causes; in these the water, at a temperature of 100 to 105° F., was kept by mechanical means in a state of violent agitation, producing a massaging effect. General aerated baths of a similar but milder character were used at a lower temperature as a general stimulant and tonic to the peripheral circulation.

Massage was widely used, and all forms of electrotherapy, except *x* rays, were available. The existence of a large massage school attached to the hospital provided an ample staff for these measures.

A feature of the treatment in these hospitals was systematic physical exercises adapted to the patient's condition. They were arranged in grades, beginning with mild exercises and progressing, as the patient improved, to more strenuous activities, including regular walks with an orderly, and games, both indoor and outdoor. Towards the end of the war occupational therapy was introduced on a large scale. Recreation was regarded as an essential feature of treatment. The results were good and in some cases remarkable.

My thanks are due to Major-General Sir A. G. Biggam and Sir Arthur MacNalty for permission to publish this chapter of the "Medical History of the War," also to Dr. Charles Newman, the Editor acting for the Ministry of Health, and Sir Francis Fraser, Director General of the E.M.S. hospitals for rheumatic conditions.

ACUTE RHEUMATISM

BY

J. ALISON GLOVER

Damp, chill, and exposure have always been considered prime factors in rheumatic fever. The conditions of modern war—the trench or fox-hole filled with water, icy exposure, sleeping in wet clothing, and the crowded dug-out or shelter—seem to make an environment favourable to rheumatic fever, and one might expect it to be outstanding among those diseases which crowd in the train of war. Yet it finds no place in Hurst's *Diseases of War*, and the various bulletins of war medicine hardly notice it. Even in times when the disease in civil practice was far more common and severe than to-day, its incidence in war was much below expectation. " Certain it is," says Lehlbach in 1863, " that we often see regiments exposed to damp, wet, cold, sudden and violent changes of temperature, and obliged to sleep on wet ground with but scant protection and no cases of acute rheumatism." Then it was—as it still is—a disease of recruits, occurring in training establishments (in war always overcrowded), rather than a scourge of armies in the field or fleets at sea. In the American Civil War we find that " acute rheumatism shows in its monthly rates a greater prevalence in that period of the war during which new levies were sent to the field than later when the levies have become inured to the hardships of active service." This preferential incidence on recruits and training establishments often takes the form of " barrack epidemics." But rheumatic fever, if not outstanding as a war disease, is important for the following reasons: it causes no small proportion of medical casualties (who require long treatment in bed); in " barrack epidemics " it may ruin for active service previously healthy recruits; it causes invaliding, and pension claims for consequent heart disabilities; as the main cause of organic heart disease in children it diminishes man- and woman-power for recruiting; and, lastly, it seems often to be the precursor of those more chronic forms of rheumatic disease to which armies in the field are particularly prone—fibrositis, lumbago, and sciatica.

Previous Wars

Table 1 summarizes estimates from the various official histories of recent wars—estimates which are never strictly comparable. In the American Civil War of 1861–4 the authors frankly point out that the contrast between the large incidence and the low death-rate, together with the low case-mortality —when the latter in civil hospitals was about 3%—alike suggest that the majority of cases assigned to acute rheumatism were, in fact, cases of fibrositis, myalgia, or conditions other than acute rheumatism. Bearing in mind Copeman's ratio of 15% referred to later, it probably would be safe to divide the incidence of 65 per 1,000 by six.

TABLE 1
ACUTE RHEUMATISM IN MODERN CAMPAIGNS

	Average annual incidence per 1,000 strength	Acute rheumatism admissions as a percentage of all non-battle admissions	Death-rate per 1,000 strength	Case mortality %
Crimea—				
(British), 1854–6 ..	24·5	3·2	1·16	4·7
American Civil, 1861–4—				
Union Army (Whites) ..	65·3*	4·7	0·20	0·44
Confederate	90*	3·6	—	4·0†
South African— ..				
(British), 1899–1902 ..	44	6·05	0·04	0·1
B E.F. France, 1915 ..	35	3·9	0·03	0·1
Dardanelles—				
(British), 1915	56	4·5	0·15	0·26
Italy, 1918				
(British) Forward Area	0·27	0·07	—	—
Troops in U.K., 1914–18	2·42	0·84	—	—
British Army—				
All areas, 1917–19 ..	—	0·32	—	—
U.S. Army in U.S. and France, 1917–19 ..	2·14	—	0·01	0·18

* Much inflated with cases of muscular rheumatism, etc.
† Based on 1,984 cases in Richmond (Van.) (Chimborazo Hospital).

In the Crimean figures the average annual incidence is calculated on a strength of 98,000, whereas at the beginning of the peak period, death, wounds, and disease had reduced the effective strength to 24,000. In considering the high case-mortality we must remember that in those days the average case-mortality in civil hospitals was reckoned as high as 3% (Loumis) (Glover, 1946).

In the South African War (1899–1902), which was characterized more by heavy marching on half rations than by severe battle casualties, the outstanding medical phenomena were the vast epidemics of typhoid and dysentery. But the admissions for rheumatic fever formed 6·05 of the total admissions for all diseases and non-battle injuries, and, during the whole war, amounted to 24,460—thus exceeding those for wounds, 21,292. The total killed and wounded was 27,273. The average annual admission rate was 44 per 1,000, the death-rate 0·04 per 1,000, and invalided 7·75 per 1,000. The case-mortality was 0·1%, half that of the American Civil

War. The heavy and rapid marching may have been an important factor in this war, and ox-drawn rations were often left far behind. On the march to Pretoria, for example, heavily laden infantry "averaged nearly seventeen miles a day over apparently endless prairies in blazing sun and bitter cold, swept now by hot and choking dust storms, now by rushes of icy hail, fording rivers and floundering through sand, with scanty food and shelterless bivouacs." (*Official History of the War in South Africa.*)

Rheumatic fever was much less prevalent in France in the Great War 1914–19 for, after four years of trench warfare, Colonel T. Hay wrote "acute rheumatic fever was not a common disease among soldiers in France, and it is improbable, therefore, that much valvular disease of the heart originated during war service." The vast majority of joint and limb pains in this war were due to trench fever and other non-rheumatic conditions.

This astounding fact—that in the wet, the mud, and the stench of the trenches in Flanders in 1915 acute rheumatism was much less prevalent than in the high and magnificent climate of South Africa—seems to show that the disease had already begun its long decline in incidence and severity.

The Decline in Rheumatic Fever

For nearly a century now, rheumatic fever has gradually shown the features of obsolescence, its incidence, and, still more, its severity steadily declining. In military history since the Crimea this trend can be seen. So in civil life it is no longer "not only one of the most prevalent, but one of the most fatal maladies incident to our precarious climate" (Macleod, 1837). No longer are more than a tenth (11·5%, Ormerod, 1852) of all admissions in general hospitals those of patients with rheumatic fever, so acute as to be readily diagnosable by high pyrexia and characteristic odour. Since 1870, their number and the proportion to total admissions in civil hospitals have fallen to a tenth of what they were, and, in peace time, there have been similar reductions in the service hospitals. The severest of its clinical features—such as hyperpyrexia, pericarditis, and nodules—are nowadays rarities, the age incidence has shifted from the younger adult age-groups to that between 5–15 years, and its social incidence falls now almost exclusively on the children of the poor, especially those of great cities. The standardized all-ages death-rate for males, 89 per million in the decade 1891–1900, had fallen to less than a quarter—22 per million, in 1937. In the military age-groups the reductions in death rates were even greater. Occasional exacerbations occurred, such as one (1915) during, and one (1920) just after the first world war, the latter perhaps an aftermath of the high level of haemolytic streptococcal infection from the great influenza waves of 1918–19. Minor peaks occurred in 1925 and 1934, but in spite of them the great decline in rheumatic fever mortality still went on.

The Inter-war Years

The inter-war years, 1919–39, were noteworthy in rheumatic fever history for three things: first, the acceleration of the decline; secondly, the inception of systematic preventive effort, especially in London, Birmingham, and Bristol; and thirdly, the strengthening of the theory (not yet conclusively proved) that infection by the *Streptococcus pyogenes* is the cause of the disease, a theory greatly strengthened by the differentiation of its serological types by F. Griffith (himself a war casualty), and the work of Lancefield, Todd, Coburn, and many others, which shed new light on the role played by this organism in the diseases wholly or partially due to its infection. The general trend and oscillations of rheumatic fever mortality closely correspond to those of scarlet fever mortality and thus support the view that both derive from the same infection, which in the latter case is undoubtedly *Strep. pyogenes.*

Barrack Epidemics of Rheumatic Fever

The investigation of "barrack epidemics" and similar outbreaks in residential schools in these inter-war years also supported the streptococcal theory. Such epidemics have certain characteristics. They occur in overcrowded communities with a high proportion of newcomers—freshly recruited adolescents. They have a regular cycle: overcrowding, a precursor epidemic of acute tonsillitis, an interval (representing the latent period in the individual) and then the occurrence of cases of rheumatic fever, usually numbering less than one-tenth of the cases of tonsillitis. A high carrier-rate (say 30 to 50%) of a single type of *Strep. pyogenes* is present, and the same type will be found in swabs from the tonsillitis patients. Such "barrack epidemics" of rheumatic fever obviously resemble those of cerebrospinal fever, save that the meningococcus itself produces no throat or catarrhal symptoms and so only a "silent" or "carrier" precursor epidemic. Recruits, in both cases, are particularly vulnerable in their first weeks of training, when the strain of unaccustomed exercises and environment lowers resistance to the infection by a fresh strain of haemolytic streptococcus, of which the virulence has probably been enhanced by rapid transference.

Surgeon-Commander C. A. Green (1942) has reported one such epidemic where the attack rate of rheumatic fever rose to 63 per 1,000. The recognition of this phenomenon is recent, but old records suggest that it has often occurred before. Thus in 1859, when acute rheumatism admission rates in the Army were still high, that for depot battalions was 65·4 per 1,000—more than twice that for the Foot Guards, 31·7. It is recorded that "many of the cases were the sequel of venereal disease," so perhaps the incidence stated is too high. The great differences in incidence for white troops between the 32 training camps in the United States in 1917–19 suggest the probability of "barrack epidemics" in some of them. The average incidence for all these

camps was 8·4 per 1,000, the highest 31·5 at Camp Cody, and the lowest 4·3 at Upton Camp.

G. C. Ferguson (1943) describes a sudden increase in admissions to military hospitals in Canada for acute rheumatism in February, March, April, and May, 1942; 331 cases were admitted in these four months, and 534 in the year ending July 31. This prevalence seems probably to have been due to something like "barrack epidemics", for 78% of the patients were between 18 and 25 years. The high carrier rate of *Strep. pyogenes* was shown by concurrent epidemics of scarlet fever and tonsillitis. The article admirably shows the need to prevent such epidemics of acute rheumatism, for 50% of the patients were invalided out of the Service (including 35% with valvular disease and 7% with rheumatoid arthritis) while, of the 50% who returned to duty, a further 20% were later invalided.

The possibility of a virus being the primary cause, and the *Strep. pyogenes* playing but a secondary role, was explored by many; but no convincing evidence emerged to support the virus theory of causation of acute rheumatism. Nor has any specific deficiency (vitamin or other) been incriminated, though a sufficient and properly balanced diet, including plenty of milk, is probably of much protective value for children and adolescents against acute rheumatism.

The World War 1939–45 : the Decline Continues

This war has involved civilians to an extent unparalleled in this country since the Anglo-Saxon invasion. Civil experience is, therefore, of great significance, especially as the war in this country began with evacuation, the unprecedented mass movement from great industrial cities of three-quarters of a million school children, the most susceptible of all the community to acute rheumatic infection. Evacuation was fortunately carried out in ideal weather, and though an epidemic of tonsillitis was noticeable (though, of course, not notifiable), in the autumn of 1939, the great decline, described in a previous section, continued through the years 1940 and 1941, and brought acute rheumatism to its nadir in 1942, in which year the crude all-age death-rate sank to 12·1 per million, scarcely half of what it was in 1939 (23), and only 56% of the previous low record of 1937 (21·5). Of actual deaths under 15, only 157 from rheumatic fever occurred in 1942, compared with 300 in 1937, and from heart disease (at least nine-tenths rheumatic in origin) only 330 (contrasted with 590 in 1937). Scarlet fever mortality showed corresponding and even greater reductions up to 1942 (Glover, 1943). The death-rate per million under 15 years in 1938 (the last whole year of peace) for rheumatic fever was 44 and for heart disease 68; in 1942 they were respectively 18 and 39; in 1943, 27 and 40, and in 1944, 28 and 42.

Evacuation of children and hospitals and the closure of many rheumatic supervisory clinics renders impossible any comparison between pre-war and war incidence on London children; but Bristol, though later suffering severely from air raids, was not originally an evacuation area, and Prof. C. Bruce Perry has kindly provided the following information. At the Bristol cardio-rheumatic clinic the total number of patients with evidence of active infection, including chorea, dropped from 201 in 1937–8 (when there were 50,800 elementary school children in average attendance in the Bristol schools) to 63 in 1941–2 (average attendance 42,545). The decline in severity was shown by only 28 of the 63 patients having arthritis, and by the fact that patients with rheumatic nodules in 1941–2 numbered only 5, whereas in 1937–8 there had been 20. [Bristol has long been known for a high incidence of rheumatic fever (J. A. Symonds, 1834).]

In Cardiff, hospital admissions dropped from 121 in 1937 to 89 in 1941–2. In Leicester the numbers of patients attending the rheumatic clinic declined from 179 (nine months only) to 102. At Great Ormond Street Children's Hospital, London, the percentage of rheumatic to total admissions in 1933–4 was 2·24; in 1937–8, 1·20; and in 1941–2, 0·83. In the Glasgow Royal Hospital for Sick Children admissions for acute rheumatism numbered 70 and formed 3·3% of the total admissions; in 1931 there had been 150 and they had formed 10·1% of the total admitted.

Since its nadir in 1942, rheumatic fever has increased a little, the crude death-rate rising to 17 in 1943, and 18 in the first half of 1944; deaths under 15 rose to 233 in 1943, all figures still much below the best pre-war records of 21·5 and 300 respectively in 1937. Scarlet fever showed a corresponding trend in incidence.

Military Experience in the 1939–45 War

The original British Expeditionary Force of 1939–40, which was evacuated from Dunkirk, had but little rheumatic fever. Copeman (1940) records that, during the first four months of this campaign admissions to base hospitals No. 2 and No. 3 for "rheumatic" conditions were about 15% of total admissions and 26·0% of all admissions in the medical division. But of the patients with "rheumatic conditions" (judging by the first 100 cases admitted to a special "rheumatism" ward) only 15% suffered either from acute or subacute rheumatic fever; the majority—70%—suffered from fibrositis; 6% from rheumatoid arthritis, and 9% from osteo-arthritis (mostly traumatic in origin). Rheumatic fever, therefore, seems to have accounted for some 2·25% of total admissions to hospital. Copeman's proportions, i.e. the percentages which admissions for rheumatic fever form of admissions for all "rheumatic diseases," after allowing for differences in terminology, are not unlike those of earlier military records, which, however, generally put the proportion of true rheumatic fever even lower (e.g. 7·9 in 1916–17–18 and 5·2 in Italy 1917–18). They may also be compared with those for insured males of corresponding age (16–35) in civil life in England and Wales in 1922, which are: acute rheumatic fever 9·2 (subacute 20·4); rheumatoid,

2·9; osteo-arthritis, 3·8; muscular rheumatism (including lumbago), 63·6. After further experience in the Middle East, Copeman (1944) has described three types of rheumatic fever: first, the "classical" type; secondly, a "benign" type, for which he suggests the title "acute febrile myalgia," and which, though not uncommon, is non-epidemic, of short duration, and without cardiac or other sequelae; and, thirdly, a type which, while "classical" in attack and as to carditis, instead of resolving, merges into chronic fibrositis.

Admission to E.M.S. Hospitals from the Services

Judging by the one-fifth samples of all service patients admitted to Emergency Medical Service hospitals in this country in 1942 and 1943 taken by the E.M.S. Statistical Branch, Ministry of Pensions, Norcross, the proportions of male patients with rheumatic fever per 1,000 of total admissions for non-respiratory and non-infective illnesses was:

	15–24	25–	35–	45–	55–	All ages
Males: 1942 ..	8 (30)*	6 (49)	5 (87)	0 (118)	0	6
1943 ..	11 (30)	6 (45)	4 (81)	0 (137)	0	7
Females: 1942	16	—	—	—	—	—
1943	11	—	—	—	—	—

* The figures in brackets show the proportions per 1,000 of total admissions as above, all patients with all "rheumatic diseases" including "rheumatism," arthritis, and fibrositis.

The median period of disablement caused by acute rheumatism at all ages was 88 days, while for arthritis it was 49 days and for muscular rheumatism 25 days. (See Report of Chief Medical Officer for 1939–45, *On the State of the Public Health during Six Years of War.*)

The approximate total number of admissions of male service patients to E.M.S. hospitals (*a*) with rheumatic fever, (*b*) with "rheumatism," arthritis, and fibrositis, is estimated (by multiplying the sample figures by five) in Table 2, for which I am indebted to Dr. P. Stocks and Miss E. M. Brooke.

TABLE 2

Period	Cases in age groups (no case over 45)			Total rheumatic fever	Total "rheumatism," arthritis, and fibrositis	Proportion of rheumatic fever, i.e. percentage which 3 is of 4	Percentage which rheumatic fever forms of admissions for all diseases
	18–	25–	35–44				
(1)		(2)		(3)	(4)	(5)	(6)
1942 1st half	220 (85)	175 (5)	45 (5)	440 (95)	3,435 (285)	12·8 (33·3)	0·51 (1·2)
2nd half	120 (80)	170 (15)	70 (5)	360 (100)	3,105 (440)	11·6 (20·3)	0·46 (1·0)
1943 1st half	270 (65)	165 (15)	65 (10)	500 (90)	2,935 (485)	17·0 (18·6)	— (0·7)
2nd half	120 (90)	110 (20)	35 —	265 (110)	— —	— —	— —

Female figures in brackets.

These figures cannot give the incidence as it is not possible to state the populations at risk, but it is apparent that the incidence was low, that it was heavier in the first half years than in the second half years in each case, and that the proportion which rheumatic fever bears to the rheumatic group as a whole is not unlike that found in France by Copeman. The figures for female patients from the Services are much smaller and much more confined to the 18–24 group, and the percentage of rheumatic fever in the whole rheumatic group is, as might be expected, considerably higher.

Invaliding

All statistics relating to acute rheumatism are difficult of comparison. It is clear, however, that the rates of invaliding for acute rheumatism have greatly diminished in the last 90 years. In the American Civil War the ration was 25·1 per 1,000; in South Africa 7·75; in the first World War I estimate the figure at 8·2 per 1,000, but I do not think that this estimate relates so accurately to acute rheumatism as does the South African war figure; it probably includes other forms than acute. It is yet too early for estimates for the Army in the war just past. Surgeon-Commander Green tells me that in the one year, 1944, in the Navy, 0·26 per 1,000 were invalided for rheumatic fever with or without cardiac lesions, and an additional 0·08 invalided for allied cardiac conditions, making 0·36 per 1,000 (males) strength.

Prophylaxis

Prophylaxis against rheumatic fever is at present identical with that against acute streptococcal tonsillitis or scarlet fever. Good ventilation and avoidance of overcrowding are still the paramount considerations, though the importance of dust suppression grows ever clearer, and dampness in houses or between decks is a factor. Chemoprophylaxis has, probably, some promise of success, especially in specially susceptible groups, such as children known to have had previous attacks of acute or subacute rheumatism.

Outbreaks of scarlet fever, sore throat, and consequent rheumatic fever, were frequent in American camps on her entry into the war. At Farragut, for example, there was a 30% carrier rate of haemolytic streptococcus, and in one year there were about 5,000 cases of scarlet fever and 1,500 severe rheumatic attacks (Coburn, 1944). Chemoprophylaxis was considered effective here.

R. Cruickshank (1946) writes:

> Mass chemoprophylaxis with sulphonamides was tried in a number of these outbreaks. Unfortunately this prophylactic measure was sometimes not instituted until the epidemic had reached its peak so that a sharp fall in incidence following its introduction was difficult to interpret. None the less, the combined evidence suggested that sulphadiazine in doses of 0·5 g. twice daily for periods of one to four weeks helped to control the epidemic spread of streptococcal throat infections. There was, however, an unhappy sequel. In the winter

of 1944–45 (the large-scale prophylactic use of sulphonamide was introduced in 1943–44) a number of outbreaks of scarlet fever and streptococcal tonsillitis occurred due to sulphonamide-resistant strains of the same types (principally types 17 and 19) as were prevalent the previous winter, and there seems little doubt that these resistant strains derived their origin from the small doses of sulphonamides used to control the earlier outbreaks of streptococcal infection.

Experience with the chemoprophylaxis of streptococcal infection in this country has been largely negative.

Recent work by Hamburger and his colleagues (1945) has suggested that the nasal carrier may be more important than the throat carrier as a reservoir and source of streptococcal infections. . . .

In civil life Cruickshank advises that—

Since most of the toxic and allergic reactions among rheumatic fever patients on prophylactic doses of the drug have appeared between the first and fourth weeks after commencement of the treatment, clinical and laboratory supervision is most essential during that period. While any patient who has had one attack of rheumatic fever might be considered suitable for chemoprophylaxis, a fair proportion of children do not develop cardiac complications. Prophylactic use of the drug might, therefore, be limited to children who have already had two attacks and to those who have had one attack accompanied by rheumatic carditis. Sulphadiazine, sulphamezathine, or sulphanilamide are the drugs of choice.

Since I completed the above article two further sources of information have become available. H. S. Barber (*Brit. med. J.*, 1946, **2**, 83), dealing with the results of treatment at an R.A.F. Rheumatic Convalescent Centre, gives the incidence of rheumatic fever in 1940 in the R.A.F. as a whole as 2·1 per thousand, whereas among the boy entrants and apprentices it was 10·4 per thousand for the same period. Secondly, D. D. Rutstein (*Amer. J. publ. Hlth.*, 1946, **36**, 463) states that, from January, 1941, to August, 1945, approximately 17,000 cases of rheumatic fever occurred in the U.S. Army, and from the onset of war to Jan. 1, 1945, 14,344 cases of rheumatic fever occurred in the U.S. Navy.

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LESIONS IN MUSCLE IN ARTHRITIS

BY

H. J. GIBSON, G. D. KERSLEY, and M. H. L. DESMARAIS

From the Royal National Hospital for Rheumatic Diseases, Bath

Recent pathological studies suggest that rheumatoid arthritis may be a disease with widespread involvement of tissues other than the joints. Curtis and Pollard (1940) were the first to describe a non-articular histological lesion which was common to all cases of rheumatoid arthritis—their cases including four with Felty's syndrome. In every one of 11 cases these authors found small perivascular infiltrations with lymphocytes in the corium of the skin and in the muscles. They regarded these perivascular accumulations of cells as evidence of a generalized disease process and as indicating that Felty's syndrome is not essentially different from classical rheumatoid arthritis. Freund *et al.* (1942) found characteristic pathological lesions in the peripheral nerves of 3 out of 5 cases of rheumatoid arthritis. The lesions were located in the perineurium, and in their most typical form presented 3 zones: (1) a central acellular zone composed of homogeneous coagulated material occasionally showing nuclear debris; (2) an intermediate zone of cells with large hypochromatic nuclei with more or less definite nucleoli; and (3) a peripheral outer zone containing numerous lymphocytes and plasma cells. The lesion was sharply differentiated from the surrounding tissue, and they regarded it as in some respects similar to the subcutaneous nodule of rheumatoid arthritis.

Nerves examined included the femoral, tibial, sciatic, and axillary; and the concentration of lesions differed widely in different nerves and different parts of the same nerve. All were perineural except one nodule which was situated in the epineural fatty tissue. The authors regarded these lesions as specific for rheumatism, and they recalled the finding by Koeppen (1932) of perivascular lymphocytic infiltrations in the sciatic nerve in 2 out of 8 cases of active acute and subacute rheumatism. They suggested that the nerve lesions might be related to pain, paraesthesia, vasomotor, secretory, and trophic disorders in the disease.

In following up the nerve lesions in the small nerve branches in muscle, the same authors, Freund *et al.* (1945), noted the presence of inflammatory lesions in the muscle itself, unassociated with nerve fibrils. There were compact accumulations of lymphocytes, plasma cells in small numbers, and occasional eosinophil and epithelioid cells. Few reticulin fibres were found in the lesions, but there was an increase of collagenous connective tissue in the endomysium and perimysium between the inflammatory cells. The lesions varied in size from 20 lymphocytes to a nodule which, in a stained section, was visible to the naked eye. Such focal lesions were found in all of 14 patients with rheumatoid arthritis on whom muscle biopsy was performed. The deltoid, triceps, and gastrocnemius were the muscles examined. The authors drew attention to the importance of the finding of such nodules in a random sample of skeletal muscle not exceeding 5 g. in weight. Associated changes in muscle fibres included a hydropic degeneration, oedema, loss of striation with marked swelling, or shrinkage and atrophy of the fibres.

Steiner, Freund, *et al.* (1946) extended and confirmed their previous observations. Focal lesions of the same kind were found in 9 more cases of rheumatoid arthritis; and a series of 196 control observations were made, including examination of muscle from cases of various nervous and muscular diseases. The control material failed to show any lesions comparable to those in rheumatoid muscle. Additional points of interest in their second series were the finding of: (1) vascular lesions consisting of adventitial and periadventitial lymphocytic infiltration—less frequently intramural lesions were found —and (2) small inflammatory foci where a muscle fibre, surrounded by cell infiltration, showed early evidence of degeneration, indicating clearly that muscle degeneration was a consequence of the inflammatory lesions.

In the course of a systematic study of pathological material from various types of rheumatic disease, specimens of muscle tissue from 11 cases of generalized arthritis have been examined.

Methods

The muscle was removed under general anaesthesia if this were required for other reasons, e.g. manipulation or synovectomy. Otherwise a local anaesthetic was used. Tissue was fixed in 10% formol-saline, and paraffin sections were made. Staining in every case was by haematoxylin and eosin and by Masson's trichrome stain. In certain cases Foot's reticulin stain and Van Giesen were also applied.

The sedimentation rate and haematocrit estimations were by the method of Collins *et al.* (1939). The corrected suspension stability (C.S.S.) is the percentage volume of red cells which it is calculated would have been found after one hour if the haematocrit reading had been 42%. Normal results are 85% or more. A fall below 60% is considered maximal.

Case Summaries

CASE 1

A woman, aged 48, with typical rheumatoid arthritis, gave a history of 20 years' involvement of all joints except the spine, hips, and shoulders. The condition

had recently become less active, the rapid loss in weight had ceased, and the corrected sedimentation stability test (C.S.S.) had improved from 79 to 88%. There was still anaemia—haematocrit 35%—and the blood uric acid was normal. *X*-ray films were typical of rheumatoid arthritis with superimposed osteoarthritic changes. The patient had had five courses of gold therapy, the last being two years ago, and was in the process of having a sixth. There were no complicating factors or other points of particular interest.

Pathology.—Muscle was removed from the right deltoid under general anaesthesia. The size of the stained section was 16 × 8 mm. Three small foci of lymphocytes were seen: (1) a very small cluster of 18 lymphocytes and 2 large epithelioid cells situated near a small vessel, the lymphocytes extending in a short row between nearby muscle fibres; (2) in the perimysium 2 perivascular nodules of small size were seen. One contained 2 histocytes with ingested pigment. A muscle fibre involved in this nodule showed swelling, basophil staining, and loss of striation (Fig. 1); (3) a small nodule of 23 lymphocytes in close proximity to a small vessel. Patchy degeneration of muscle was shown by proliferation of muscle nuclei, which were sometimes enlarged and elongated, hyperchromatic, and situated within the fibre rather than at its edge, as described by Steiner *et al.* (1946).

CASE 2

A man, aged 54, had rheumatoid arthritis with a 14 years' history of joint involvement, all joints except those of the spine being affected. The disease was quiescent, and the man, having lost much weight, was now beginning to put it on again. The C.S.S. had improved from 50 to 55%, the anaemia from 34 to 40% haematocrit; and the plasma uric acid was 3·4 mgm. per 100 c.cm. *X*-ray films were typical of rheumatoid arthritis. The patient had had many courses of gold, the last a year ago. There was a nodule on the left elbow, but no other special features.

Pathology.—Muscle biopsy was from the left vastus externus and the section was 9 × 5 mm. in size. Histologically 1 small nodule was seen containing 24 lymphocytes, 3 polymorphs, and a number of epithelioid cells, in close proximity to a small vessel. The muscle fibres were separated by a general increase of fibrous tissue, and vascular lesions were conspicuous, many of the arterioles having thickened walls and in some cases the lumen was almost obliterated.

CASE 3

A woman, aged 33, had suffered from arthritis of the knees for 4 years, beginning directly after a "blitz." Latterly, swelling had been confined to the right knee only. The only ascertainable focus of infection was one tooth which had been removed. There had been no loss of weight, and the general condition was good. The C.S.S. was still rather rapid, but had risen from 62 to 75%. The haematocrit was 41%. No gold had been administered.

Pathology.—Muscle biopsy from the right vastus internus. The tissue was a fusiform fragment 17 mm. long × 5 mm. broad at its widest part. Two small foci of perivascular lymphocytic reaction were present, but the striking feature of this slide was what appeared to be a rounded scar (Fig. 2). Dense fibrous tissue enclosed a few scattered muscle fibres which were shrunken in size. The area was not near either of the two lymphocytic foci found. As in the previous case, a general increase of fibrous tissue was also present, with evidence of muscle degeneration in the form of proliferation of nuclei and basophil staining of individual fibres.

CASE 4

A woman, aged 45, had had 3 attacks of rheumatic fever at the ages of 10, 21, and 30. The heart was not involved. Soon after the third attack she noticed deformity of her fingers and gradual stiffening of her wrists, elbows, shoulders, and knees. When admitted to hospital in 1946 she showed the picture of a typical rheumatoid arthritis, with marked muscle wasting and symmetrical involvement of all joints except the spine and hips. The knees were flexed to 100° with a range of 30°.

The haematocrit was 33%, the C.S.S. 67%. *X*-ray films were typical of rheumatoid arthritis with secondary osteoarthritic changes. On admission she was recovering from a recent attack of herpes zoster of the right leg. There was no history of rheumatism in the family.

Pathology.—Muscle biopsy was from the right deltoid. The size of the stained section was 14 × 10 mm. This was histologically the most striking case of the series. Large fusiform masses of cells were found which were visible to the naked eye in sections stained by haemotoxylin and eosin. They were perivascular in relation to thin-walled vessels running between muscle fibres.

Lymphocytes, plasma cells, eosinophils, and larger cells of epithelioid type with oval vesicular nuclei and a fine chromatin network were present. In this section eosinophils were a striking feature, and in some of the areas they were the predominant cell (Fig. 3). At the periphery of the nodule, strands of lymphocytes were seen penetrating between individual muscle fibres. Evidence of muscle degeneration as described in Case 1 was present, and there was an increase of interstitial fibrous tissue. This case, with numbers 6 and 7, formed a group in which the foci were endomysial in location, as compared with the remainder, in which they were situated in the supporting connective tissues of the muscle.

CASE 5

A miner, aged 63, gave a history of 9 years of rheumatoid arthritis, involving the knees and elbows particularly. The muscle wasting was not marked, and there had been no recent loss of weight.

On admission in Jan., 1946, the knees were very painful with flexion deformity and slight bilateral effusion. The C.S.S. was markedly raised (59%). The haematocrit was normal (44%) and the blood uric acid 3·1 mgm. per 100 c.cm. The *X* rays showed changes of rheumatoid type with secondary osteoarthritis. He had had two courses of gold therapy with good response, and also deep *x*-ray therapy to the knees. There was nothing else of interest in the past or family histories.

Pathology.—Muscle biopsy was from the vastus internus. The tissue was very loose in texture, and the stained section was 10 × 4 mm. There were few satisfactory fields. The muscle itself was free from infiltration; but an adjoining fragment of fibrous tissue, detached from the main mass in the section examined, contained a cluster of 43 lymphocytes. No definite evidence of muscle degeneration was seen. This is regarded as a doubtful example of muscle involvement.

CASE 6

A housewife, aged 52, had a history of gradual onset of pain, stiffness, and swelling of both knees and fingers of 8 years' duration. There was no gross loss of weight, and her main symptoms were a villous arthritis of the knees. The haematocrit and C.S.S. were normal. She

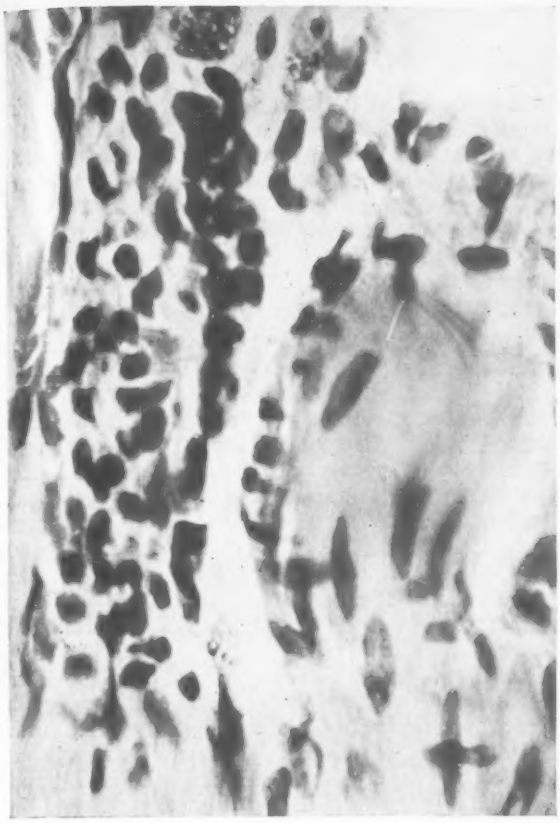

FIG. 1.—Nodule from muscle of Case 1. Between the fibres is seen a collection of lymphocytes and plasma cells with 2 phagocytic histocytes containing pigment. The muscle fibre adjacent is swollen and somewhat basophil in staining reaction, and contains many elongate nuclei. (H. and E. × 400.)

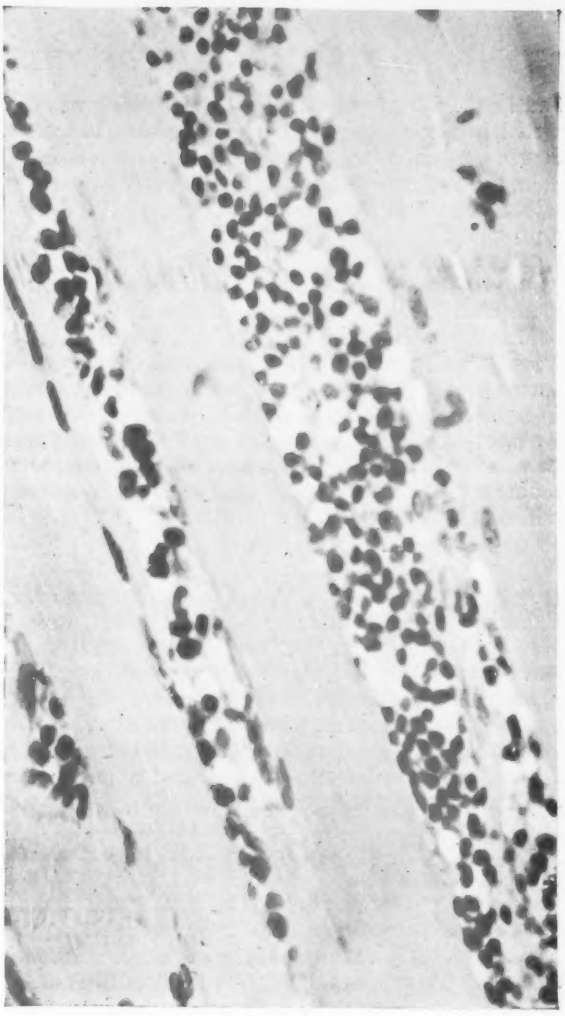

FIG. 3.

FIG. 3.—Deltoid muscle from Case 4 to show endomysial focus between muscle fibres. Eosinophils were a striking feature in this case. Lymphocytes and plasma cells are also present. (H. and E. × 100.)

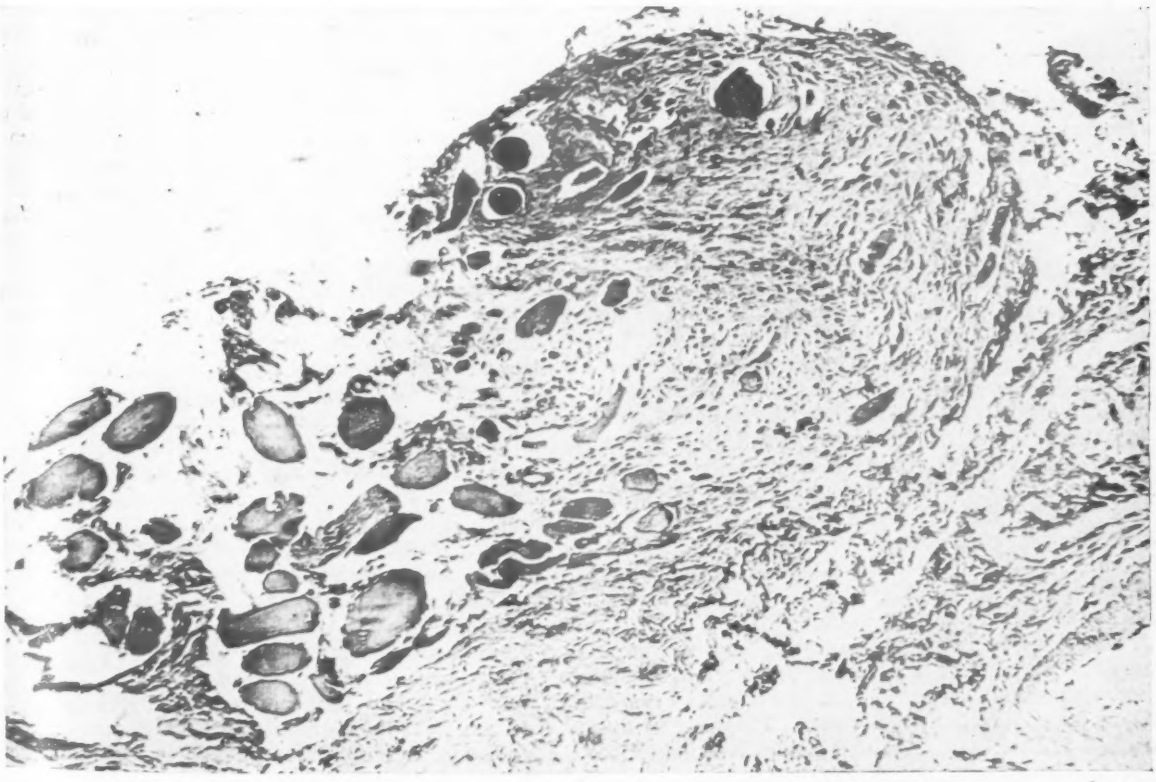

FIG. 2.—Right vastus externus from Case 3. A rounded mass of fibrous tissue is present in which fragments of degenerate muscle fibres are embedded. (Masson's Trichrome Stain × 100.)

had had a full course of gold therapy which was completed in Jan., 1946, with no appreciable benefit. A course of deep *x*-ray therapy to her knees relieved the pain, but had no effect on the swelling. A synovectomy of the right knee was performed in July, 1946. *X*-ray films showed changes of old rheumatoid arthritis with secondary osteoarthritis of the knees. There was a history of rheumatoid arthritis in the grandmother on the mother's side, but nothing else of interest.

Pathology.—Biopsy was from the right vastus internus, 22 × 7 mm., and the left deltoid, 8 × 4 mm. In the vastus 2 very small nodules were seen near vessels situated in fibrous tissue. In the deltoid 1 small nodule of 27 lymphocytes closely investing a small thin-walled vessel between muscle fibres was found. This was a further example of the endomysial perivascular reaction exemplified in Cases 4 and 7.

CASE 7

A housewife, aged 43, gave a history of rheumatoid arthritis of 7 years' duration. All the joints were involved except the spine and hips. In 1944 the right knee was the main problem, there being marked swelling and periarticular thickening. A synovectomy and patellectomy was performed with good result, and she was able to resume light home duties. In 1945 the left knee became very painful and swollen, and a patellectomy and synovectomy was performed in 1946. Apart from an initial loss, her weight had remained constant for five years. The haematocrit and C.S.S. have fluctuated between 38–41% and 62–66% respectively. *X*-ray films showed changes of typical rheumatoid arthritis. She had had two courses of gold without great improvement. Her mother was crippled with rheumatoid arthritis. There was nothing else of interest to note.

Pathology.—Biopsy was of the right deltoid, 8 × 5 mm., and right vastus internus, 13 × 9 mm. In the deltoid 6 small nodules were found. Four surrounded small vessels of capillary dimensions and were closely invested by muscle fibres. They tended to be spindle-shaped, recalling the structure seen in Case 4. The remaining 2 were in the perimysium and were situated near small arterioles.

In the vastus internus there was 1 small nodule only, encircling a vessel in fibrous tissue. Muscle showed marked degeneration of type similar to that seen in Case 10. Muscle nuclei were very numerous, irregular in size and shape, and with many hyperchromatic forms.

CASE 8

A male, aged 56, had had typical rheumatoid arthritis for seven years. The onset was insidious with gradual symmetrical involvement of all joints except the shoulders, hips, and spine. There was marked muscle wasting and flexion deformity of elbows and knees. The epitroclear glands were enlarged. The C.S.S. was 72%, the haematocrit 37%, and the blood uric acid 3·1 mgm. %. *X* rays showed changes of rheumatoid type with secondary osteoarthritic changes in the knees. There was great loss of articular cartilage, with several cystic areas in the femoral condyles and upper ends of the tibiae. There was no history of rheumatic fever. The man had suffered from a discharging right ear in the past which was dry at the time of examination.

Pathology.—Muscle was removed from the right vastus externus at the time of synovectomy of the right knee. The size of the section was 12 × 8 mm. Five foci of lymphocytic infiltration were seen. They were situated in close relation to vessels, but not perivascularly (see Fig. 4). There was considerable increase of fibrous tissue and marked thickening of vessel walls, affecting the intima. This was similar to the changes found in the arterioles of subcutaneous nodules and synovial membrane of rheumatoid arthritis. Some of the muscle fibres were shrunken, and in this section showed an appearance of vacuolation; but degenerative changes were not striking.

CASE 9

A housewife, aged 41, gave a history of rheumatoid arthritis of 10 years' duration. There was marked muscle wasting, with symmetrical involvement of wrists, fingers, knees, shoulders, and feet. There had been an appreciable loss of weight, and recently flexion deformity of knees had developed, necessitating gradual straightening with serial plasters and eventually manipulation under a general anaesthetic. The C.S.S. was 86%, the haematocrit 31%. She had had two courses of vaccine, in 1926 and 1943, but no gold. *X*-ray films of hands showed typical changes of rheumatoid arthritis. There was no past history of rheumatic fever and no history of rheumatism in the family.

Pathology.—Muscle was taken from the right deltoid, 15 × 5 mm. Two small lymphocytic foci were present. In each case some 12 to 20 lymphocytes were seen beside a small vessel. Degenerative changes in muscle were confined to a patchy increase in number of muscle nuclei and slight irregularity in staining of the fibres. The smaller arterioles showed thickened walls, as noted in previous cases.

CASE 10

A male Civil Servant, aged 48, gave a history of rheumatoid arthritis of 9 years' duration. Three phases could be distinguished in the evolution of the articular lesions in this case: Firstly, an oligoarticular phase of relatively short duration, during which the wrists were mainly involved; secondly, a longer articular phase affecting all the joints, which showed the typical rheumatoid arthritic changes; and, thirdly, a phase of articular disorganization and subluxation affecting nearly all the joints of the hands, the right shoulder joint, and the joint between the 3rd and 4th cervical vertebrae. The hands were markedly deformed, with stunted fingers of the achondroplastic type. The extensive disorganization of the metacarpo-phalangeal and inter-phalangeal joints allowed abnormal movements of the fingers in all directions. This picture was very similar to the one described and illustrated by Layani (1939). During the phase of articular disorganization a swelling about the size of a large plum appeared in the region of the right shoulder, and this was subsequently shown at necropsy to consist of an encysted mass containing thick yellowish-grey material very rich in cholesterol. As a result of the disorganization and dislocation of the joint between the 3rd and 4th cervical vertebrae, a classical picture of compression of the cord developed at that level. During the course of the illness there was a variable degree of secondary microcytic anaemia, the haematocrit varying between 34 and 41%. The C.S.S. was consistently lowered, ranging between 59 and 64%. The highest figure recorded for the blood uric acid was 3·1 mgm. per 100 c.cm. At necropsy, in addition to the lesions observed ante-mortem, both peri- and endocarditis and fibrinous pleurisy were found.

Pathology.—Muscle was taken from the right biceps, 22 × 10 mm., and the right rectus, 18 × 11 mm. The specimen from the biceps showed an extreme degree of muscle degeneration, fibrosis, and round cell infiltration (Fig. 5). The muscle fibres were shrunken, convoluted,

and vacuolated, and showed nuclear changes as described by Steiner *et al.* (1946). Muscle nuclei in some areas were very large, elongated, and hyperchromatic, while others showed an aggregation of nuclei giving an appearance like giant cells. The cell infiltration was predominantly lymphocytic. No eosinophils or plasma cells were seen. Some of the foci were perivascular and elongated, as seen in Case 4; others were rounded, diffuse, and paravascular. The right rectus muscle was free of any marked evidence of disease. A few scattered lymphocytes in fibrous tissue near vessels were the only sign of involvement.

CASE 11

A male, aged 48, gave a history of rheumatoid arthritis of 6 years' duration. The onset was sudden, involving all the joints except the hips and spine. At the time of his last admission in 1946 the activity had decreased, judging by the recent gain in weight. C.S.S. rose from 50 to 67%, and haematocrit from 35 to 40%. The patient had had five courses of gold therapy, the last completed in March, 1945. *X*-ray films showed changes of rheumatoid type, with secondary osteoarthritic changes.

Pathology.—Muscle was taken from the right vastus internus, 22×10 mm. The muscle showed a general increase of fibrous tissue, and there were 4 lymphocytic nodules in the perimysium. In each case they were somewhat diffuse and were situated near a thick-walled arteriole, but not strictly in perivascular relation to it. Near one of the foci there was an increase of dense fibrous tissue enclosing shrunken and degenerate muscle fibres. The appearance was that of scar tissue as seen in Case 3 (Fig. 6). In Masson-stained sections there was no evidence of fibrinoid change in this fibrous area.

Summary of Findings

Biopsies were performed on 10 typical cases of rheumatoid arthritis and one doubtful case. There were 5 men and 6 women, of ages varying from 33 to 63, and with symptoms of 2 to 20 years' duration. The C.S.S. at the time of biopsy ranged from a borderline normal of 88% to a maximal decrease of 55%. In all cases flocculation tests for syphilis were negative.

Case 3 was not typical, in that only the knees were involved; the patient had not lost weight, there was no anaemia, and the C.S.S. was only 75%. Cases 1, 6, and 11 were clinically quiescent, had been gaining weight, and the C.S.S. was improving. Cases 3, 4, 8, and 9 were the only ones in which gold had not been administered at some stage in their treatment. In Case 4 there was a strong past history of rheumatic fever shortly before the first onset of typical rheumatoid symptoms. Case 10 is of special interest in that a post-mortem examination was available.

Provisionally, 2 histological types have been classified.

(1) *Perivascular Location in the Muscle Itself.*—This gave an elongate or fusiform nodule closely invested by the muscle fibres. The vessel, of capillary dimension, in this case showed no change. The inflammatory cells, lymphocytes, plasma cells and eosinophils, were closely packed and tended to overflow into fissures between neighbouring fibres. These are the endomysial lesions of Steiner *et al.* (1946), and were seen in Cases 4, 6, and 7.

(2) *Paravascular Lesions in the Fibrous or Fatty Stroma of the Muscle.*—The vessels often showed thickening of the wall; and the cell infiltration, almost entirely lymphocytic in type, appeared to begin in the adventitia and to spread away from the vessel. The nodule formed was of loose texture and not sharply defined. It resembled closely the smaller accumulations in synovial membrane, in synovial fat, and in the perineurium. This type of lesion, classified by Steiner *et al.* (1946) as perimysial, was found in Cases 1, 2, 3, 4, 5, 8, 9, 10, and 11.

The difference between the two types is not merely one of location, but also of histological make-up and relation to the vessel involved, in the first group a dilated capillary, in the second a sclerotic arteriole.

MUSCLE CHANGES

In a few cases gross evidence of degeneration was present. The fibres were shrivelled and tortuous, with marked proliferation of nuclei, which showed rounded, oval, and sausage-shaped forms, often with hyperchromatism and loss of their vesicular form. In these cases they were sometimes found heaped together as in a giant cell. As also noted by Steiner *et al.* (1946), we frequently observed less marked degeneration of individual fibres, remote from lymphocytic foci, in which there was loss of transverse striation, longitudinal fissuring, and, in some cases, vacuolation. Elsewhere muscle degeneration was found adjacent to cellular infiltrations. The three pathological processes — viz. lymphocytic foci, arterial thickening, and muscle degeneration—varied considerably in their relative proportions in different specimens, and did not appear to be entirely interdependent.

In general the pathological findings agreed closely with those of Freund *et al.* (1946), with 2 further observations. (1) Eosinophils were found in great profusion in one case (No. 4). They are suggestive, in view of the work of Rich and Gregory (1943), Levinthal (1939), and others, who have put forward a theory of the aetiology of rheumatism involving anaphylactic hypersensitivity. (2) The finding of scar tissue enclosing degenerated shrunken muscle fibres has not previously been reported so far as we are aware. It was seen in Cases 3 and 11.

All examinations of muscle specimens from controls, including some cases of ankylosing spondylitis, have so far been negative, but investigation of biopsy material from other " rheumatic " and toxic conditions are being continued. A piece of muscle from a case of acute fibrositis with extremely tender muscles and slight periarticular swelling, but no loss of weight, wasting, decreased sedimentation stability, or anaemia, showed no inflammatory cell reaction, but some swelling of muscle fibres, staining deficiency, and loss of striation, with an increase in muscle nuclei.

LESIONS OF SIMILAR HISTOLOGY IN NON-MUSCULAR TISSUES

While our studies were chiefly concerned with muscle, lesions of comparable type in other tissues in cases of rheumatic disease may be mentioned.

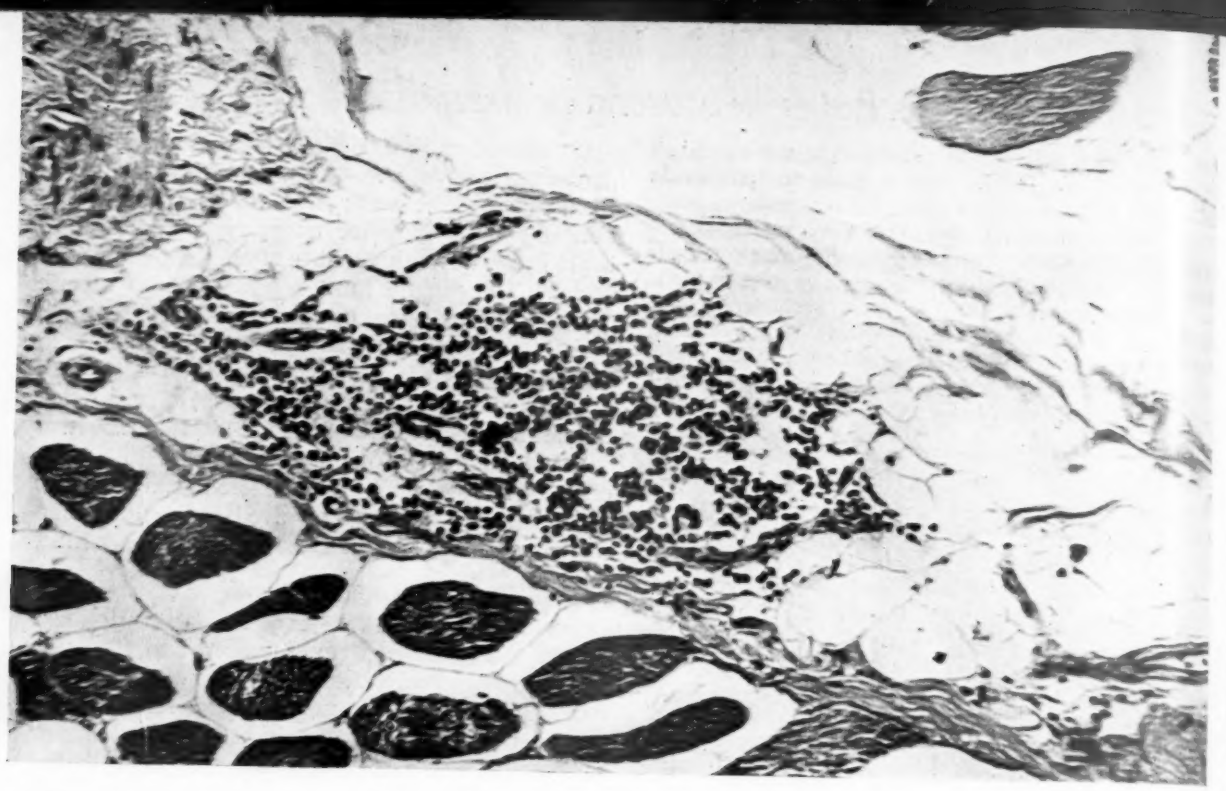

FIG. 4.

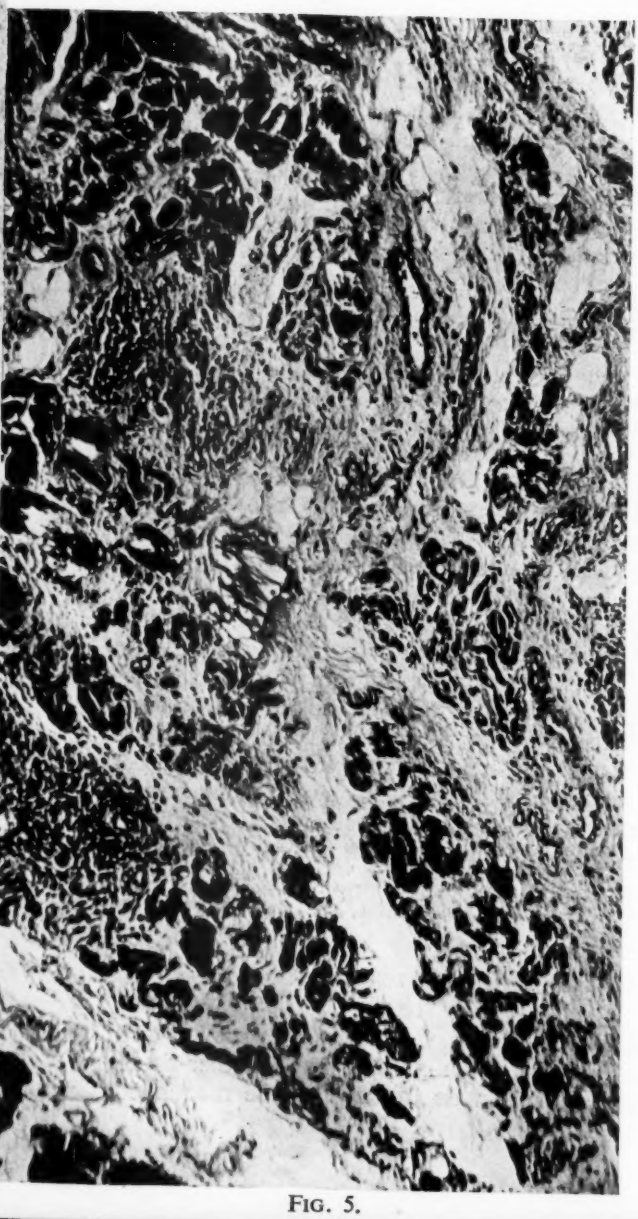

FIG. 5.

FIG. 6.

FIG. 4.—Right vastus externus of Case 8. A diffuse lymphocytic focus in the perimysium. Three small vessels are seen towards one end of the nodule. Infiltration between muscle fibres has not occurred. (H. and E. × 100.)

FIG. 5.—Right deltoid from Case 10. This shows the most extreme degree of muscle degeneration, fibrosis and lymphocytic infiltration which has been observed in this series. (Masson's Trichrome × 100.)

FIG. 6.—Right vastus externus of Case 11, to show replacement of muscle by fibrous tissue. Within the scar tissue are seen the shrunken remnants of muscle fibres A lymphocytic focus is present at the margin of the area of fibrosis. (Masson's Trichrome × 100.)

FIG. 7.—Radial nerve from Case 10. An arteriole with marked thickening of its wall is seen within the perineurium. Its adventitia is infiltrated with lymphocytes which extend diffusely into the adjacent connective tissue. Numerous capillary vessels are present within the focus. (H. and E. × 200.)

FIG. 8.—Fat from knee joint of Case 6. A paravascular lymphoid focus of very similar structure to that shown in Fig. 7 is present. (Masson's Trichrome × 200.)

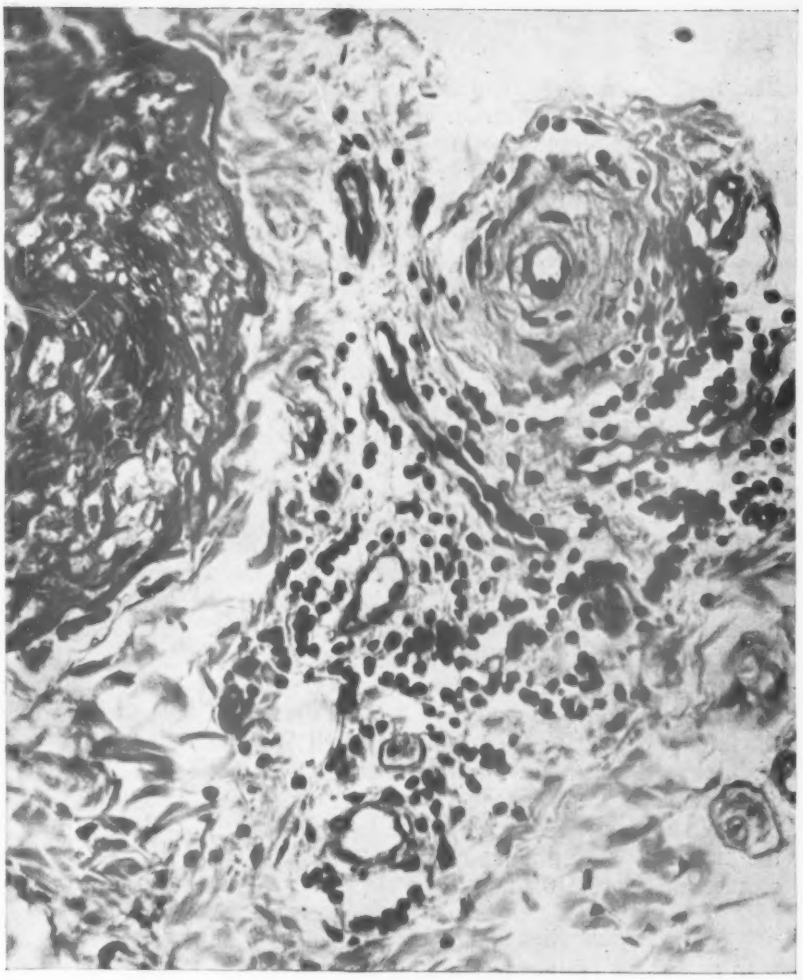

FIG. 7.

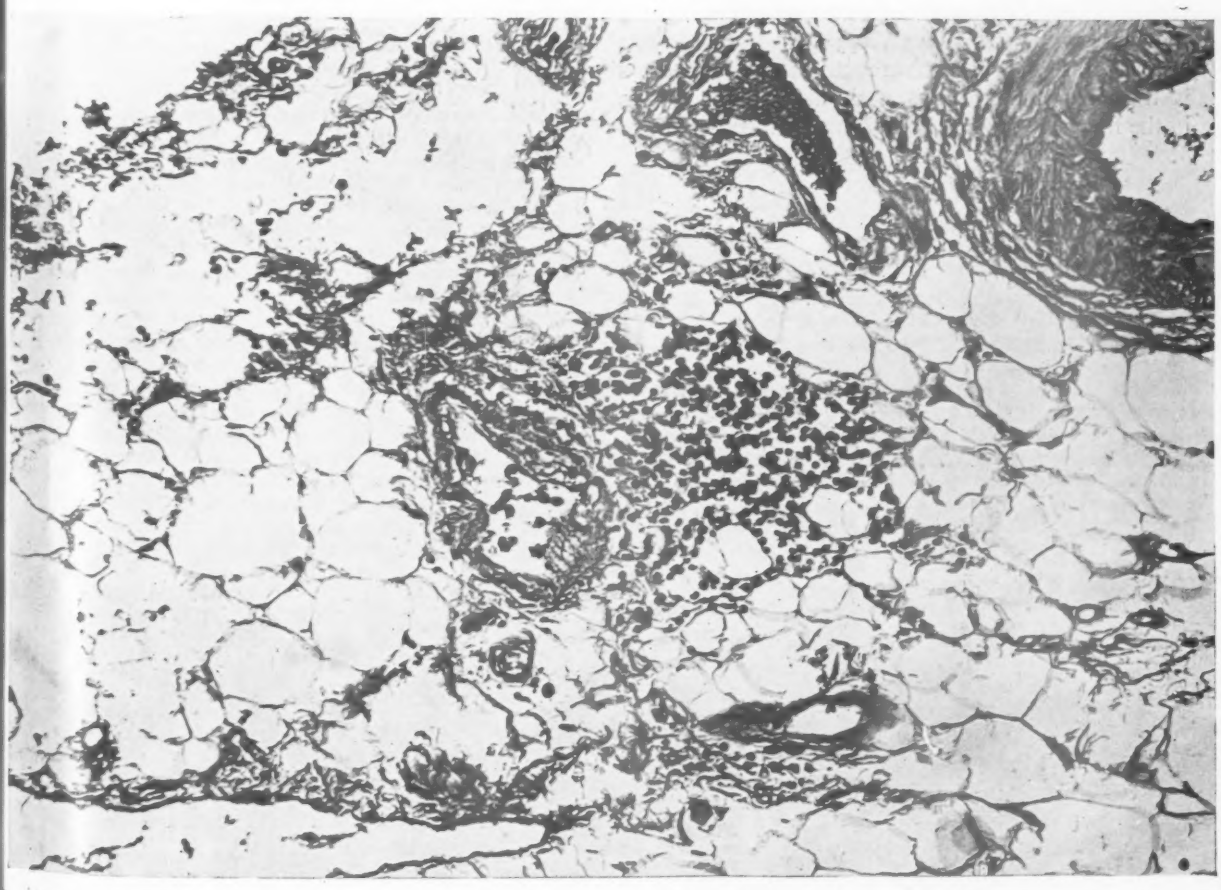

FIG. 8.

The first is a lesion found in the radial nerve of Case 10 of the present series. In the first block—selected quite at random—in which the nerve was cut transversely, 2 lymphoid foci were seen in the supporting fibrous tissue. They were in close relation to arterioles, with thickened walls. In each case lymphocytes were present at one point in the adventitia, and extended diffusely into the adjacent fibrous tissue (Fig. 7). The findings were in keeping with those of Freund *et al.* (1942), in the condition described by them as nodulous rheumarthritic perineuritis.

The second instance was seen in fatty tissue removed with synovial membrane from the knee joint of Case 6. As seen in Fig. 8, it is entirely within the adipose tissue. A small arteriole is involved, part of the wall showing adventitial lymphoid infiltration which extends away from the vessel. In the synovial membrane in this case the lymphocytic accumulations of Allison and Ghormley (1931) were large, abundant, and highly characteristic in their structure. The finding of histological evidence of involvement of fat is not without interest in view of the finding by Collins (1940) that 3 out of 7 painful nodules in fibrositis were fatty in nature, and that of Copeman and Ackerman (1944) that the trigger points in lumbar fibrositis corresponded exactly with the basic fat pattern of the region. These findings require further investigation.

Discussion and Summary

In specimens of biopsy material taken from the muscles of 10 typical cases of rheumatoid arthritis, and of one with some atypical features, a characteristic histopathology was found, thus confirming the work of Freund, Steiner, and Leichtentritt. The lesions consisted of perivascular cellular reactions in the muscles themselves, and paravascular lesions in the fibrous and fatty supporting connective tissue.

The relationship to blood vessels suggests that the noxious agent is a blood-borne irritant, but throws no light on whether or not it is infective in origin. All affected tissues were of mesodermal origin. The fact that lesions were found in specimens removed at biopsy from muscles selected at random indicates the very widespread nature of the condition. Similar changes were found in active and quiescent cases, whether or not they had been treated by gold.

The same histopathology has not so far been seen in any control material examined, but the histology of muscle from patients suffering from non-rheumatic conditions and rheumatic cases other than rheumatoid arthritis is still undergoing investigation.

The diagnostic value of biopsy in the pre-arthritic state, when wasting and pain precede definite joint changes, is a matter requiring further study, as the arthritis may possibly prove to be secondary to soft-tissue involvement.

We wish to express our indebtedness to the Physicians of the Royal National Hospital for Rheumatic Diseases, Bath, for permission to obtain biopsy material from patients under their care; and to the Sydney Robinson Research Fund, for defraying the expenses of photography.

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EMPIRE RHEUMATISM COUNCIL

POST-GRADUATE TRAINING IN CHRONIC RHEUMATIC DISEASE

On June 25 the second course of lectures on rheumatic disease to be arranged by the Empire Rheumatism Council was opened with an inaugural lecture by Lord Horder. The course was a complete success and entries were so heavy that a few applicants had to be refused admission.

It was somewhat shorter and more practical than the previous one. It commenced on the Tuesday and finished on the Saturday, and, like the one before, was held at the British Red Cross Society Clinic for Rheumatism, at Peto Place, London.

The syllabus covered was wide and consisted of the following lectures: The Effect of Environment and Climate on Rheumatic Disease (Dr. M. B. Ray); Rheumatoid Arthritis (Dr. W. Tegner); Still's Disease (Dr. B. Schlesinger); *X*-ray diagnosis (Dr. E. Samuel); Spondylitis (Dr. K. Stone); Osteo-arthritis (Dr. E. Fletcher); Physical Methods in Rheumatic Diseases (Dr. J. W. T. Patterson); The "Disk Syndrome" (Mr. P. Ashcroft); Gout (Dr. G. D. Kersley); Non-articular Rheumatism (Dr. W. S. C. Copeman); Pathological Investigation in Rheumatism (Dr. J. W. Shackle); Orthopaedic Aspects in Rheumatism (Mr. W. D. Coltart); Social and Industrial Aspects (Dr. B. Nissé).

THE HEBERDEN SOCIETY

A meeting of the Heberden Society was held on May 31, 1946. Dr. George Graham and Mr. Jackson Burrows read a paper on spinal osteoporosis of unknown origin, which it is hoped to publish in full in the *Annals of the Rheumatic Diseases*. After this Professor Noah Morris contributed some observations on osteoporosis. He said that in a group of patients with ages varying from 50 to 93 years the incidence of generalized osteoporosis was found to be greater after the end of the seventh decade. Women, especially multiparae, were more frequently affected. The blood chemistry of the osteoporotic group did not differ significantly from that of the others. On a normal diet the retention of minerals was within normal limits, while an increased intake led to increased retention which in several cases was maintained for over six months. In spite of this, no evidence of increased calcification was obtained in the *x*-ray pictures. There appeared to be no relationship between clinical or radiological signs of arteriosclerosis and the degree of osteoporosis. No evidence was obtained that endocrine dysfunction played a part in the pathogenesis of senile osteoporosis. In a group of post-encephalitic patients who had been kept in hospital on an adequate calcium intake for periods between ten and twenty years, the incidence of osteoporosis appeared to be correlated with the degree of helplessness of the patient. It would seem, said Professor Morris, that lack of exercise plays an important part in the pathogenesis of osteoporosis; and he put forward the suggestion that failure of *x*-ray improvement after prolonged administration of calcium might be due to the fact that in older patients the individual bone trabeculae were much thinner and fewer than normal, and that, although architectural structure was maintained, the formation of new trabeculae was difficult if not impossible.

Dr. R. F. A. Dean contributed some interesting observations to the discussion.

The Chairman of the meeting, Dr. C. W. Buckley, described a case of progressive osteoporosis of the vertebra which had not reacted to vitamin D therapy but which had been greatly improved by the administration of thyroid and progesterone.

Dr. Bywaters enquired about the orthopaedic treatment and prognosis of a case of osteomalacic spondylitis which had already developed a marked deformity. Dr. Kersley replied that he had at the moment a patient of 65 with a very severe kyphosis due to wedging of the vertebral bodies, which had collapsed during the last six months. The blood calcium, phosphorous, and phosphatase were normal, and the Wassermann negative; and although at first there had been loss of weight, this had now ceased. This man, with breathing and postural exercises, coupled with only part-time rest in a plaster bed—the time in bed being limited by the presence of severe chronic bronchitis and dyspnoea—had straightened up considerably and lost all pain in the course of a month's treatment. It was now hoped to fit him with a brace.

BOOK REVIEWS

Journal of Gerontology, Vol. 1, No. 1, January, 1946. Published quarterly for the Gerontological Society, Inc., by Charles C. Thomas, Publisher, 301–327, East Lawrence Avenue, Springfield, Illinois, U.S.A. (Editor-in-Chief, Robert A. Moore.) Price $6.50 a year.

We welcome this new quarterly devoted to a branch of medicine which has been too much neglected in the past. As the editor writes, " with millions of men and women growing older, baffled by changes in themselves and in the world around them, the country has a definite need for not only large-scale provisions for their care, but also for a specific and individual service for each one. Against the present, almost brutal neglect of the aged, by which many have been misused, we need a national policy to guide our social, political, and economic activities toward the aged. Scientific endeavours may be enlisted to aid in this major problem of preventing wastage of human resources and of increasing human conservation." These sentiments apply equally to this country where, with a smaller population, it is even more necessary for the aged to remain useful. This first number opens with a general introductory essay, and contains an interesting article on the logarithmic increase of mortality as a manifestation of ageing, which shows—statistically at least—that there is no inherent reason why human active life should not be considerably prolonged. Then follow articles on ageing in plants and the influence of certain hormonal-like substances on postponing these changes; on the influence of nutritional factors, especially vitamin B, on determining the onset of senile changes, and on the effects of thymectomy in mice in prolonging life and preventing leucaemia. There are also articles on a community club for old people, and on the economic aspects and the place and importance of the few surviving old people in primitive societies. A study of the involution of certain tissues in foetal life before the individual is even born illustrates how certain parts of the body die before the rest. There is an interesting essay by Dr. Draper on the attitude of Shakespeare to old age. Relevant current topics are dealt with in a series of editorial notes; and particulars of the Gerontological Society, Inc., which sponsors the periodical, are given. The paper, type, and illustrations are excellent. A novel feature is a companion smaller edition for the general reader; this contains the same articles shorn of all technical terms. There is no doubt that many readers, both medical and lay, will find much of interest in this addition to medical literature and we wish it every success. R. G. G.

OBITUARY

The death of Dr. Bernard Comroe at the early age of 38, is a serious loss to the ranks of workers in rheumatology. Bernard Isaac Comroe attended the University of Pennsylvania School of Medicine, Philadelphia, and became a specialist certified by the American Board of Internal Medicine, and a Fellow of the American College of Physicians. He was a member of the American Rheumatism Society, and the third edition of his book, *Arthritis and Allied Conditions*, was reviewed in the *Annals* of September last. It had passed through three editions within five years, a sure testimony to its value. It displayed remarkable originality in style and conception and a most extensive knowledge of the literature of the subject, which promised well for future contributions from his pen. He had made also other contributions to research, and his death is a serious loss to the ranks of workers in this wide and important field of medicine.